december 1952
THE FOUNDRYMEN'S OWN MAGAZINE

American Foundryman

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Lectromelt
RAISED THE ROOF
and electric arc melting COSTS CAME DOWN

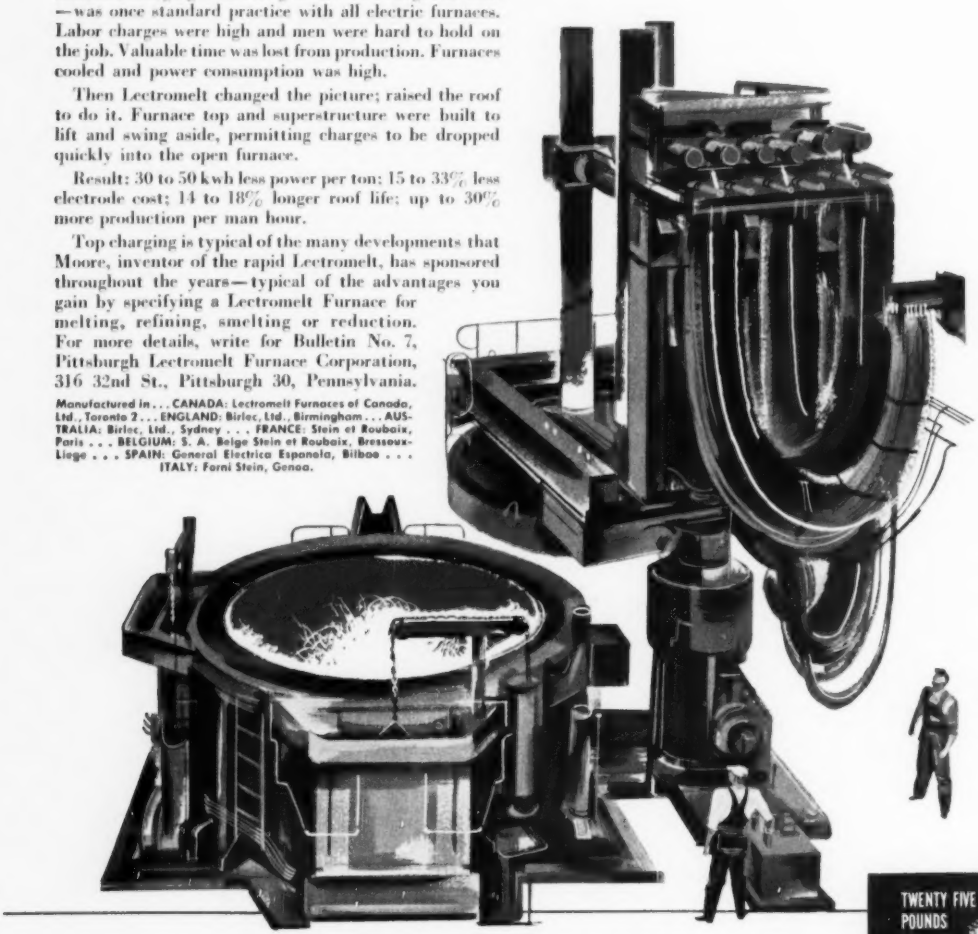
Machine charging—shoveling materials through the door—was once standard practice with all electric furnaces. Labor charges were high and men were hard to hold on the job. Valuable time was lost from production. Furnaces cooled and power consumption was high.

Then Lectromelt changed the picture; raised the roof to do it. Furnace top and superstructure were built to lift and swing aside, permitting charges to be dropped quickly into the open furnace.

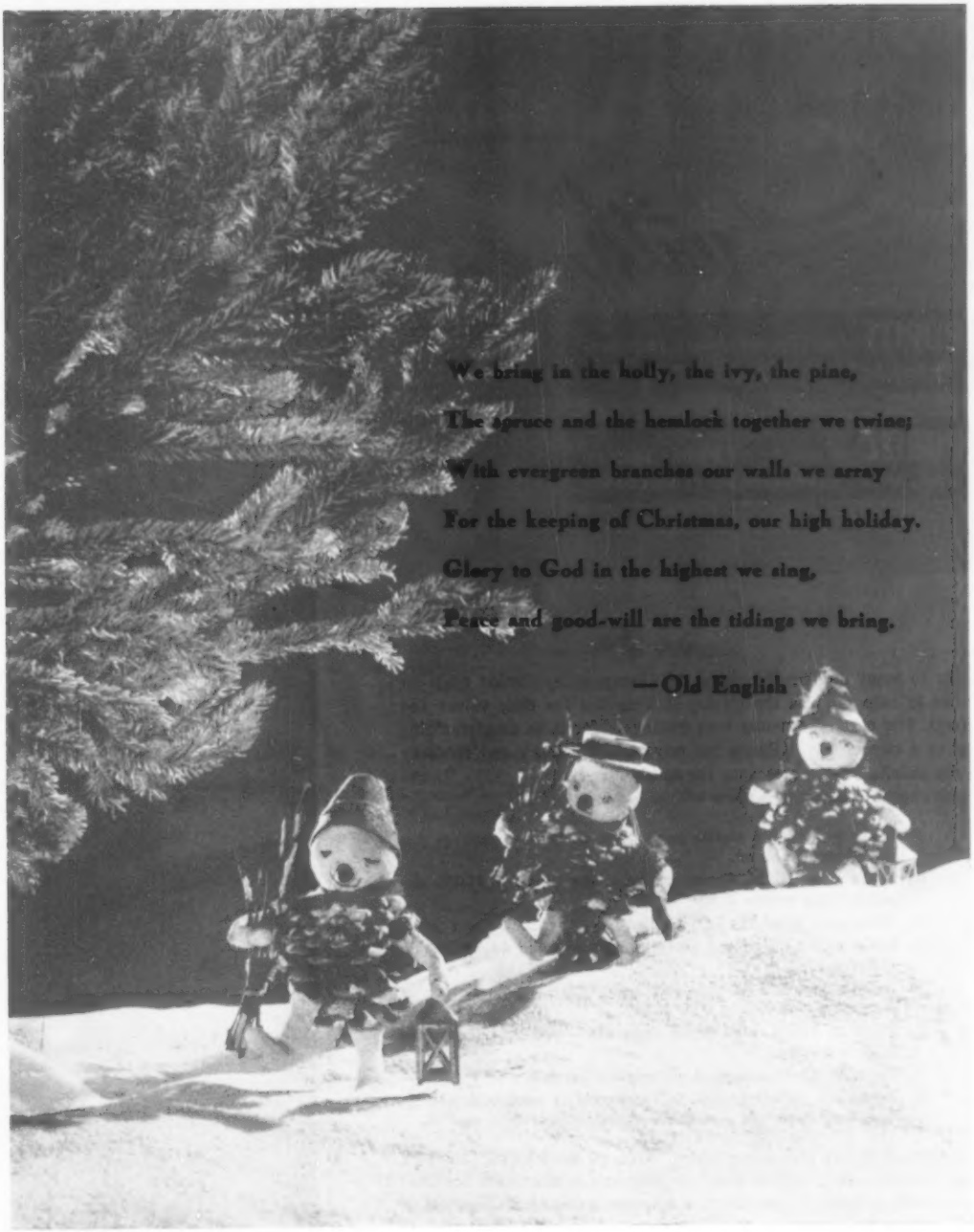
Result: 30 to 50 kwh less power per ton; 15 to 33% less electrode cost; 14 to 18% longer roof life; up to 30% more production per man hour.

Top charging is typical of the many developments that Moore, inventor of the rapid Lectromelt, has sponsored throughout the years—typical of the advantages you gain by specifying a Lectromelt Furnace for melting, refining, smelting or reduction. For more details, write for Bulletin No. 7, Pittsburgh Lectromelt Furnace Corporation, 316 32nd St., Pittsburgh 30, Pennsylvania.

Manufactured in . . . CANADA: Lectromelt Furnaces of Canada, Ltd., Toronto 2 . . . ENGLAND: Birlec, Ltd., Birmingham . . . AUSTRALIA: Birlec, Ltd., Sydney . . . FRANCE: Stein et Roubaix, Paris . . . BELGIUM: S. A. Belge Stein et Roubaix, Bressoux-Liege . . . SPAIN: General Electrica Espanola, Bilbao . . . ITALY: Forni Stein, Genoa.



WHEN YOU MELT... MOORE RAPID *Lectromelt*


We bring in the holly, the ivy, the pine,
The spruce and the hemlock together we twine;
With evergreen branches our walls we array
For the keeping of Christmas, our high holiday.
Glory to God in the highest we sing,
Peace and good-will are the tidings we bring.
—Old English

FEDERAL

Holiday Greetings...

THE FEDERAL FOUNDRY SUPPLY COMPANY • CLEVELAND, OHIO

MORE FINISHED CASTINGS PER TON OF METAL POURED

with

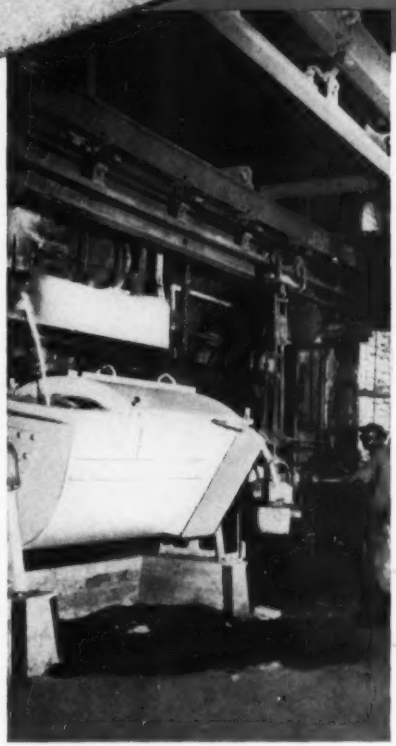
PURITE—100% Fused Soda Ash. The Scientific Flux for Better Melting and Cleaner Iron

PURITE—is sold by all leading foundry supply houses in the United States and Canada

Like so many modern foundries, the Stockham installation relies on Purite to help produce the quality iron needed for their valves and fittings. For cleaner, sounder iron castings... for ladle desulphurizing and as a cupola flux... Purite has proved its efficiency and economy by its industry-wide acceptance for nearly 30 years.
These exclusive advantages show why —

1. Purite produces a higher percentage of finished castings per ton of metal poured.
2. Purite gives 100% fluxing action in the cupola — 100% desulphurizing action in the ladle.
3. Purite gets to all the iron quicker.
4. Purite is time-tested and proven for unsurpassed desulphurizing uniformity.
5. Purite comes in 2-lb. pigs and 2-oz. tablets — no weighing or measuring required.
6. Purite is 100% pure fused soda ash — you do not pay for inert materials.
7. Purite does not crumble — no waste — no dust.
8. Purite can be shipped in bulk carloads at substantial savings over bag shipments — is easily stored without deterioration.

Purite can help you cut casting losses. Write for the booklet, "Refining and Desulphurizing Cupola Iron"; it illustrates in detail the accepted ways in which Purite is most effective. Mathieson Chemical Corporation, Baltimore 3, Maryland.



Stockham Valves and Fittings uses Purite in this 10,000 lb. mixing and desulphurizing ladle in their grey iron foundry. The cast iron pipe fittings and iron valve parts made from this iron meet the requirements of ASTM A-126, Class B.

Mathieson
CHEMICALS

SERVING INDUSTRY, AGRICULTURE AND PUBLIC HEALTH

American Foundryman

December 1952 / *Volume 22 • Number 6*

Published by American Foundrymen's Society

Universal symbols of great occasions, bells are among the most ancient products of the metal casting industry. In keeping with the season and the hope of free men everywhere, the December cover depicts one step in preparation for casting the 10-ton, Anglo-American "Freedom Bell." Workman is using strickle board in sweep molding the core for casting—a practice still common among European bell founders. For more facts and pictures on bell founding turn to article on page 50.

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leading foundries

select

COLEMAN

There is a Coleman Oven to help give you maximum production on every core baking or mold drying job—regardless of the size and shape of your castings. Coleman Ovens in leading foundries from coast-to-coast are proving vital in increasing casting tonnage at low cost...with less man power!

It will pay you to investigate how Coleman Ovens can solve your baking and drying problems. Our 50 years of engineering experience is available without obligation.

BAKING AND DRYING TIME REDUCED regardless of size and shape of cores and molds, increasing turnover of plates, dryers, and flask equipment.

MOST EFFICIENT HANDLING METHODS for your type of work and plant conditions...eliminate delays and losses.

PERFECT CORE BAKING ends manpower and casting losses due to make-overs and rejects.

PERFECT MOLD DRYING for true-to-pattern castings and easy cleaning.

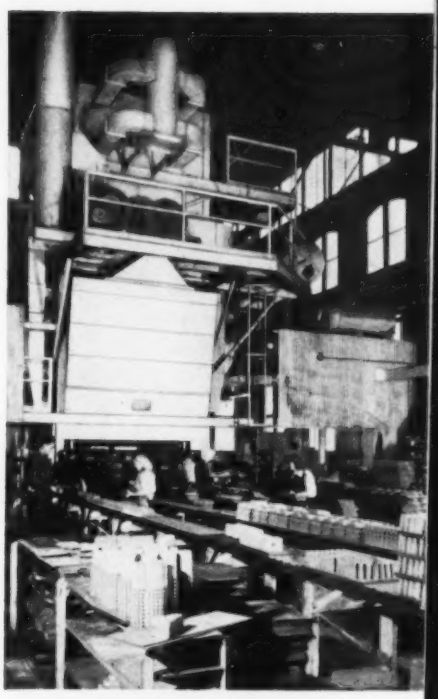
INCREASED PRODUCTION by making the most efficient use of skilled and unskilled labor.

HEAVY DUTY CONSTRUCTION for continuous dependable performance, economical operation, and minimum maintenance cost.

GREATEST SAVINGS IN FUEL by using the most economical fuel available.

SAVE BINDER. Proper core baking atmosphere and uniform temperature permit important savings in conventional binders.

USE HIGH SPEED CORE BINDERS. Coleman Ovens have uniform temperature and accurate control to handle temperature-sensitive resins and pre-baked oils.



COLEMAN TOWER® OVEN
Eastern Malleable Iron Company, Wilmington, Delaware.

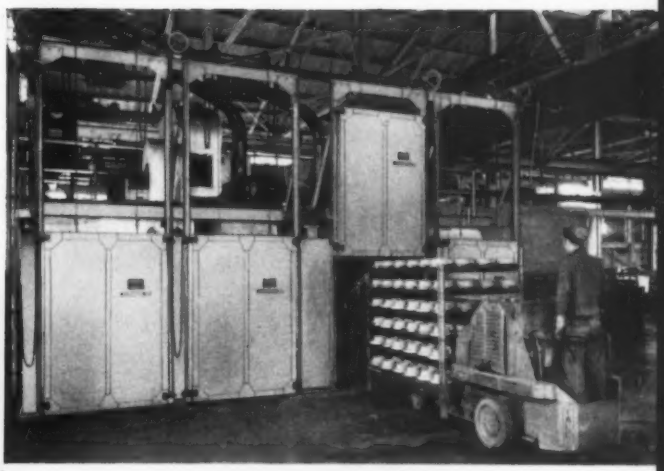
A COMPLETE RANGE OF TYPES:

COLEMAN OVENS are built in a complete range of sizes and capacities for every core baking and mold drying requirement: Tower Ovens, Horizontal Conveyor Ovens, Car-Type Ovens, Transrack Ovens, Rolling Drawer Ovens, Portable Core Ovens, Portable Mold Dryers, etc.

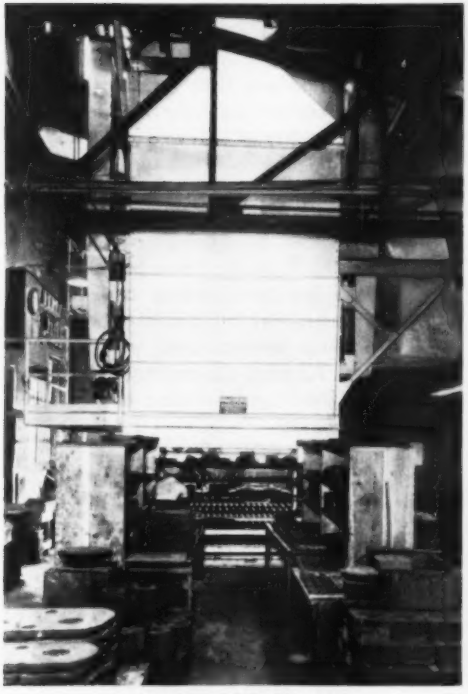
Write for Bulletin 48

from coast to coast

OVENS



COLEMAN TRANSRACK CORE OVENS
United States Pipe & Foundry Company, Decota, California.



COLEMAN TOWER® OVEN
National Supply Company, Springfield, Ohio.

COLEMAN CAR-TYPE MOLD OVEN
The Bullard Company, Bridgeport, Connecticut.

THE FOUNDRY EQUIPMENT CO.

1831 COLUMBUS ROAD **CLEVELAND 13, OHIO**

WORLD'S OLDEST AND LARGEST FOUNDRY OVEN SPECIALISTS

100% Alloy recovery

WITH AJAX-NORTHRUP INDUCTION HEAT

Ajax-Northrup furnaces are famous for their ability to give back what you put into them. They melt *any* metal with minimum losses, at high speeds, and with extremely accurate control of analysis and pouring temperatures.

For example, a foundry using these furnaces to melt stainless steel for corrosion and heat resistant castings reports the following figures on recovery of elements going into the make-up of 18-8 type alloys:

Ni: 100% Cr: 99% Mn: 90%
Si: 94% Mo: 95% Cb: 92%

Another Ajax user saves $60,000 a year just by reducing chromium losses alone. Still another controls pouring temperatures within 20 deg. F., turns out castings so perfect that repair welding has been eliminated.

Ajax-Northrup can save metals and money for you, too. Write us today for details.

SEND FOR NEW INDUCTION HEATING AND MELTING BULLETIN

134

FOR HEATING AND MELTING

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AJAX ELECTROTHERMIC CORPORATION

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AJAX ELECTRO METALLURGICAL CORP.
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YOU NEED THE BEST CORE WASH

Buy MEXADIP™

- **MEXADIP WILL NOT FERMENT.** You will not have to dump your wash because of hot humid conditions — no pock marks or pitted coating surfaces with MEXADIP.

- **MEXADIP STAYS IN SUSPENSION.** Let it stand over the week end, it will be ready to go Monday morning.

- **MEXADIP WILL NOT RUN, BUILD UP OR RUB OFF.** It applies equally well on either green or baked cores.

- **MEXADIP IS DEPENDABLE AT ANY BAUME.** It is applied daily to cores for thousands of tons of castings over a range of 10-40 degrees Baume.

- **MEXADIP REQUIRES NO LONG "PASTE" MIXING.** No waiting period is necessary. Just add the powder to water and after a few minutes of stirring it is ready to go.

IMPROVE CASTING APPEARANCE AND SAVE MAN HOURS IN THE CLEANING ROOM. If you have a problem with core wash, MEXADIP will solve it. Ask us to arrange a test today.

Why wait . . .
Start now — Use MEXADIP™

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the appointment as exclusive sales representative to the Iron and Steel Industry for the products of the

CERIUM METALS CORPORATION

153 Waverly Place, New York 14, N.Y.

producers of rare earth metals and alloys.

- *Mischmetal*
- *Cerium and rare earth alloys*
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Dry dipping of port cores with DELTA GRAKOAT

DELTA CORE WASHES ARE USED *Exclusively* BY

STUDEBAKER

AT THEIR FAMOUS SOUTH BEND FOUNDRY

**Dry dipping of V-8 crankcase core with DELTA Z-Z-KOAT*

OTHER DELTA FOUNDRY PRODUCTS

CORE AND MOLD WASHES:
FOR ALL TYPES OF SAND CAST METALS: STEEL, GRAY IRON, MALLEABLE AND NON-FERROUS.

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PARTING COMPOUNDS

•

MUDDING & PATCHING COMPOUNDS

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NO-VEIN COMPOUND

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MOLD SURFACE BINDERS-LIQUID

•

PERMI-BOND

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DRI-BOND
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96•8 SAND RELEASE AGENT

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CORE ROD DIP OIL NO. 224X

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SAND CONDITIONING OIL

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CORE OILS

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. . . FOR *QUALITY, SPEED AND ECONOMY*

DELTA GraKoat Wash . . . (the original white plastic-type wash developed by DELTA laboratories 18 years ago) has been used consistently by leading automotive and tractor foundries ever since it was first introduced.

Here are the reasons why:

1. EASY TO APPLY
2. MOISTURE PROOF
3. NO PRECIPITATION
4. NO GAS
5. HIGHLY REFRACTORY
6. UNUSUALLY HIGH FUSION
7. ADHERES TO SAND
8. PRODUCES SMOOTHER SURFACES
9. COST LESS TO USE

*DELTA Z-Z-Koat Wash is a zirconium wash. It has all the characteristics of DELTA GraKoat Wash plus a higher fusion point and heat conductivity which produce a quick surface-metal set.

A liberal working sample will gladly be sent to you, free of charge, at your request.

DELTA OIL PRODUCTS CO.

MANUFACTURERS OF SPECIALIZED FOUNDRY PRODUCTS

MILWAUKEE 9, WISCONSIN

today's best buy is better air!

Inset: Cross section of Type N ROTO-CLONE Hydro-static precipitator with double impeller.

Type N ROTO-CLONE exhausts fine dust from portable grinding operation at the American-Standard plant in Louisville.

ROTO-CLONE collects fine grinding dust ...improves worker efficiency

Fine dust from portable or flexible shaft grinding can seriously affect production. If uncontrolled, the fine particles produced by these operations remain suspended over long periods, and in many instances create a visible fog of floating dust. Such a condition reduces both operator efficiency and unit production.

American Radiator and Standard Sanitary Corporation eliminates this dust problem from their workrooms with AAF Type N *ROTO-CLONES. These versatile *hydro-static precipitators* efficiently exhaust, separate and store dust in one compact unit. The exclusive design of the Type N ROTO-CLONE also provides uniform air delivery and assures sufficient air flow at hoods and unvarying velocities in ducts and branch pipes at all times.

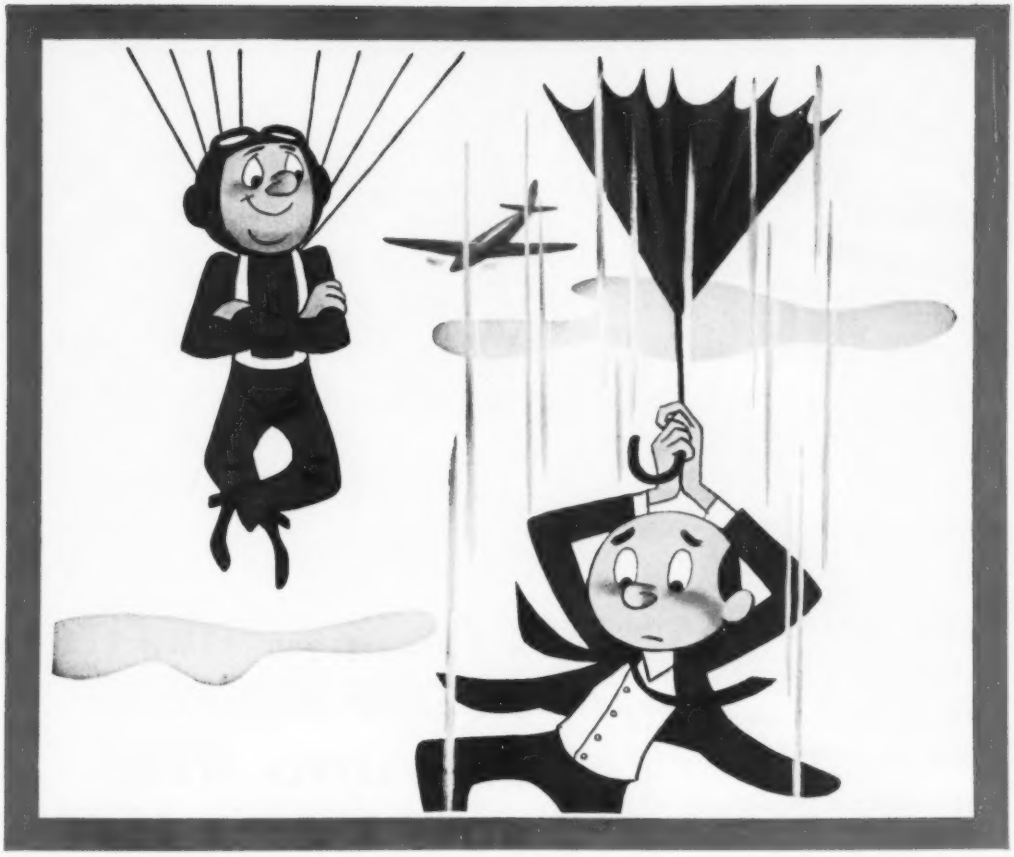
Here's another big plus! The ROTO-CLONE's high efficiency allows recirculation of cleaned air back to working areas, thereby saving heat loss.

To improve efficiency on grinding, buffing or similar operations investigate the complete line of ROTO-CLONE dust collectors. Call your nearby AAF representative or write direct to us for Engineering Bulletin No. 277-A.

**ROTO-CLONE is the trademark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

American Air Filter
COMPANY, INC.
104 Central Avenue, Louisville 8, Kentucky

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, Cal.



FOR SURE RESULTS IN MAKING A CASTING, USE

PENOLYN CORE OIL

For Maximum Foundry Efficiency . . . be sure to specify Penolyn Core Oil. There is a grade of Penolyn for every type of casting, to meet the most exacting requirements of every conceivable Foundry and Core Room Practice.

Penolyn Core Oil offers these 10 Important Features for full efficiency—

- Uniformity
- Concentrated form
- No obnoxious odor
- No seepage
- No crusting of green mix
- Clean working
- Wide temperature baking range
- Polymerized formulation
- Minimum gas
- Ample collapsibility

PENOLA OIL COMPANY

NEW YORK • DETROIT • CHICAGO • ST. LOUIS

Penola

FOR EXPERT TECHNICAL ASSISTANCE—be sure to call the nearest Penola Office for any technical data or assistance you may need regarding your casting operations.

OTHER DINGS PRODUCTS FOR THE FOUNDRY—

Electric and Non-electric Magnetic Pulleys

Non-electric Magnetic Drums

Non-electric Perma-Plate Magnets

Self-Cleaning Perma-Plate Magnets

Rectangular Suspended Magnets

Self-Cleaning Rectangular Suspended Magnets

Portable and Stationary Pulley-type Separators

DINGS ALL-WELDED, WEATHERPROOF LIFTING MAGNETS:

- LIFT A LITTLE MORE
- WEIGH A LITTLE LESS
- LAST A LITTLE LONGER
- BUT COST NO MORE

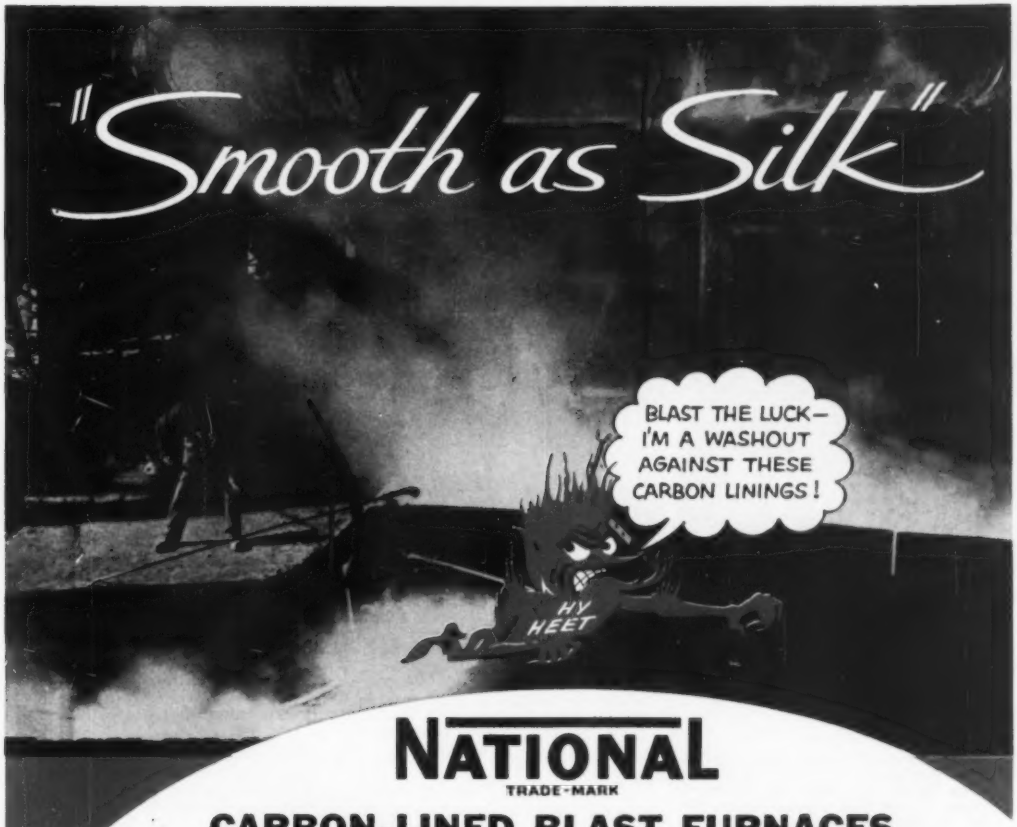
BACKED by over 50 years of experience in the field of electro-magnet construction. Dings has supplied more foundries with magnetic separators than any other firm. When you need a lifting magnet check the DINGS.

Write for catalog B-1401-A giving construction details, capacities, ratings and dimensions.

DINGS MAGNETIC SEPARATOR COMPANY
4747 W. Electric Ave., Milwaukee 46, Wis.

Dings Magnets

LM-3



NATIONAL
TRADE-MARK

CARBON-LINED BLAST FURNACES

TYPICAL of the many comments favoring carbon-lined furnaces after the recent strike, was that made by the manager of a large eastern mill.

Describing his carbon hearths as coming back on blast "smooth as silk", he joins the many other users reporting faster, easier, more economical return to normal operation with carbon lined furnaces than with any other type of lining.

MORE THAN 30% OF ALL U. S. BLAST FURNACES ARE NOW LINED WITH "NATIONAL" CARBON!

The terms "National" and "Eveready" are registered trade-marks of Union Carbide and Carbon Corporation

NATIONAL CARBON COMPANY
A Division of Union Carbide and Carbon Corporation
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DOLLARS and SENSE...

point to "Eveready" No. 1050 Industrial Flashlight Batteries . . . delivering twice as much usable light as any battery we've ever made before. Their unique construction prevents swelling or jamming in the case . . . has no metal can to leak or corrode.

OTHER NATIONAL CARBON PRODUCTS

BLAST FURNACE LININGS • BRICK • CINDER NOTCH LINERS • CINDER NOTCH PLUGS • ELECTRIC FURNACE ELECTRODES • SPLASH PLATES • RUNOUT TROUGH LINERS • MOLD PLUGS

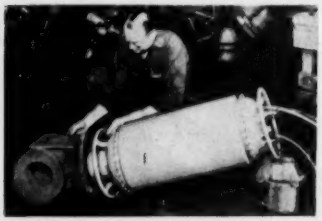
products and processes

For additional information,

use postcard at bottom of page seventeen.

Mobile X-ray machine

Small, lightweight, mobile X-ray unit features snout for making exposures inside pipe and castings without changing



their positions. Unit is 44 in. long, with less than 15 in. diameter, weighs 150 lb, operates at 75,000 to 250,000 volts. Has beryllium "window" for x-raying light metals. *General Electric*

For more data circle No. 1 on card, page 17.

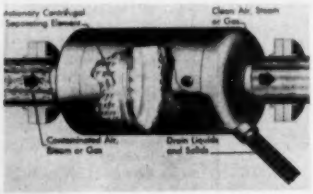
Bonding resin

Borden announces development of the first powdered phenolic core-bonding resin suited to curing in di-electric ovens. Called Thor Plastic Binder FB-111, it responds well to characteristic temperatures of such ovens, has long stable storage life, and imparts green strength to uncured cores. *Borden's.*

For more data circle No. 2 on card, page 17.

Duct Purifier

Unit for removing dust, oil, moisture from steam, air, gas lines has no moving parts or baffles. Removes entrainment by stationary element that imparts rapid, controlled centrifugal motion to vapor without appreciable drop in pressure. In

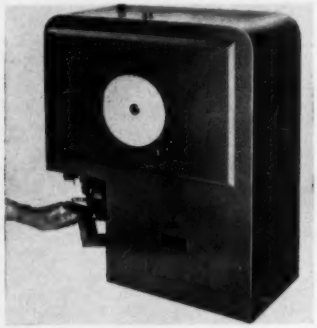


all standard sizes to 24 in. for pressures to 600 psig; larger sizes and special designs made to order. *V. D. Anderson Co.*

For more data circle No. 3 on card, page 17.

Moisture determiner

No. 279 Quickmoisture determines amount of moisture and granular or fibrous materials in foundry sand. Process takes about 30 seconds. Fast-moving stream of thermostatically controlled hot air dries sample. Built-in electronic balance automatically weighs samples of 10 to 35 grams,



indicates percentage of moisture at any stage of processing and total loss after drying. *Harry W. Dietert Co.*

For more data circle No. 4 on card, page 17.

Portable temperature controller

Precision control is obtained merely by plugging instrument into wall outlet and

plugging the unit to be controlled into the instrument. By inserting instrument thermocouple into an oven, bath, etc., true temperature is indicated by upper pointer and may be controlled at any point by setting lower pointer to correct scale position by means of an external setting knob. Two power outlets permit control of blowers, fans, agitators, as well. Thermocouple break protection is provided to prevent overheating of thermal system in case thermocouple breaks or burns out. Has magnetic amplification instead of vacuum tubes to eliminate service interruptions caused by tube failure. *Taco West Corp.*

For more data circle No. 5 on card, page 17.

Finger protection

Steel balls stitched into ends of extra-long glove fingers protects worker's hands against crushing. Gloves, of leather, are available with 5-in. gauntlet cuff or 2½-in. safety cuff. *Boss Mfr. Co.*

For more data circle No. 6 on card, page 17.

Furnace charger

Gas-electric powered 4,000-lb capacity furnace charger picks up and deposits load by tilting action of load carrier, which pivots backward a maximum of 10 degrees. Chassis is rear-control stand-up model with heavy-duty 4-speed drive. *Mercury Mfg. Co.*

For more data circle No. 7 on card, page 17.

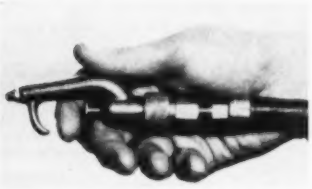
Pocket magnifier

For inspecting fine detail in small joints, welds, and castings, and for similar shop uses, a fountain-pen size 10-power magnifier with built-in illumination is available. Light supplied by two penlight batteries and bulb passes through magnifier lens to the object without allowing direct light to reach operator's eyes. Mount is black tenite with chrome-plated handle. *Bausch & Lomb.*

For more data circle No. 8 on card, page 17.

Blow gun

Trigger button gives two-stage blow action for breeze or blast. Leakproof shut-off valve has no springs or levers to break down. Nozzle swivels on ball bearings, eliminates hose-kinking delays. Integral



hook permits hanging. Gun is designed to withstand damage from dropping and other abuses. *Supreme Machined Products Co.*

For more data circle No. 9 on card, page 17.

Portable roller conveyor

Features of a new line of portable roller conveyors are a 2½-in. channel

continued on page 17

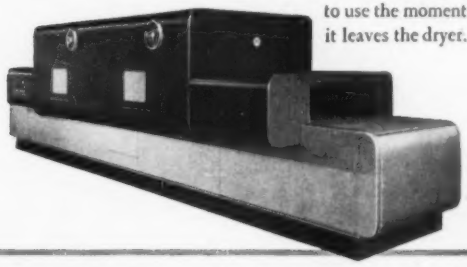
FOUNDROMATIC
Dielectric
SAND CORE DRYER

This core measures 7 x 7 x 4 inches . . . weighs 9¼ pounds.

Why take 1½ hours to bake a core like this?

dry it in 4 minutes

***Foundromatic* sand core dryers** take only a fraction of the time of conventional ovens, yet produce a core with smooth finish and superior shakeout characteristics. Best of all, the core is cool enough to handle with bare hands, and ready to use the moment it leaves the dryer.



Now there's no need to build up a stock of cores ahead of time. Use a *Foundromatic* core dryer and make cores only as you need them.

LOW FUEL COSTS TOO

There's no waste heat! All the heat goes into the core instead of the air. When there are no cores between the electrodes no energy passes between the electrodes.

Result: low fuel costs . . . no heat, smoke, fumes in the core room.

Find out more about this fast, economical way of drying cores. Call your nearby Allis-Chalmers district office, or write Allis-Chalmers, Milwaukee 1, Wis.

Foundromatic is an Allis-Chalmers trademark.

Questions and Answers . . . About Dielectric Sand Core Drying

1. *How does the core dry?*
By passing high frequency currents through the moist sand, the molecules are set in motion and the resultant friction generates sufficient heat to drive off the moisture from the inside.

2. *Why are resin binders used in place of core oils?*
Core oils require high temperatures and long drying time for complete polymerization. Resin binders cure at lower temperatures . . . approximately 250° F.

3. *What about collapsibility?*
Resin bonded cores have very good collapsibility, contributing to a faster, cleaner shakeout.

4. *I want a very hard core, but still want good collapsibility. What do I do?*
Spray the cores with a film of moisture just before putting on conveyor belt. This will give high surface hardness without affecting the collapsibility.

5. *Can core wash be eliminated?*
In many cases, yes. The resin forms a reducing atmosphere resulting in smooth castings, without necessity of applying core wash.

6. *Is any special or additional equipment needed?*
None, except plastic dryers to hold shaped cores. Marinite or transite plates are recommended.

7. *Can metal dryers or plates be used?*
Yes, but it will result in reduced production. The metal will act as a shield around the sand, requiring the core to be run a second time without the dryer or plate.

8. *I have metal dryers which I do not want to replace at once. Can I use them?*
Yes. Run the cores through in the normal manner. Turn the cores out on plates and remove the dryer and run the cores through again.

9. *How many plastic dryers will be needed?*
Far less than the normal amount of metal dryers. A maximum of 50 plastic dryers should suffice for each job unless more than one coremaker is working on the same job.

ALLIS-CHALMERS

Allis-Chalmers A-3890
Milwaukee 1, Wisconsin

Please send me new 8-page booklet 15B7306B containing complete information on the Foundromatic sand core dryer.

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products and processes

continued from page 14

of 12-gauge material secured by four angle-iron cross braces, 12-gauge rollers of 2-in. diameter with formed ends and machine bearings. Conveyors are available in 12-, 16-, 18-, 20-, and 28-in. widths, with rollers on centers of multiples of 3-in. or 4-in. *Mechanical Handling Systems, Inc.*

For more data circle No. 10 on the card below.

Metal hardness tester

Weighing 7 oz., this pocket-size instrument permits testing internal mold and die sections within an area as small as 1 sq. in. Has only two moving parts, no diamond point to grind, no penetrating ball. Since hardness is checked by rebound, surface of metal is not marred as much as when tested by penetration. Direct readings are obtained on any of three Rockwell and Brinell scales without using conversion charts. Easily kept in calibration by using standard test blocks. *Peabody Industries, Inc.*

For more data circle No. 11 on the card below.

Sand additive

Triplact, a new sand additive, is said to improve foundry practice in three ways, by: 1) Increasing flowability of sand to provide harder, denser molds and improved finish. Sand becomes softer, silkier, more workable, rams better on vertical surfaces and deep pockets. 2) Providing reducing atmosphere needed to stop "burn-in" and penetration. Castings clean better and faster, eliminating need for washes, dips, sprays, or blackening. 3) Controlling both expansion and collapsibility to eliminate buckles, scabs, and veins, reduce tendency toward cracking or straining. Does not cause lumpy shakeout. Insures greater return of sand to system during shake-out. *Eastern Clay Products.*

For more data circle No. 12 on the card below.

Motorized head pulley

Motor, gears, and all other moving parts are enclosed within steel drum of conveyor belt pulley, eliminating need for chains, countershafts, and other exposed parts that may be damaged or worn by grit and weather. Pulley rotates about motor, which is held stationary on conveyor frame by torque arm. Vent holes in drum shell cools motor and pulley. *Iowa Mfg. Co.*

For more data circle No. 13 on the card below.

Dust collectors

Available both in cabinet and in cyclone types, Torit dust collectors meet requirements of heavy-duty continuous grinding and other high dust-volume applications. Easily replaced nylon diaphragm recommended for operations involving grainy dust; rubber-faced hinged plate valve for dusts that include shavings, chips, other sharp matter. *Torit Mfg. Co.*

For more data circle No. 14 on the card below.

Core blower

Designed for high-speed production, a new core blower will blow and draw eight cores in a box with a 5½-second machine cycle. Automatic cycle control is governed by hydraulic air timer, making operation possible by unskilled labor. An adjacent roll-over can be operated while the machine is going through its blowing cycle. Chrome-plated valve seats protect timer from corrosive foreign matter in air lines. A stationary magazine assures perfect alignment of core box at all times. Core box handling devices may be installed easily. A large throat opening permits smoother flow of sand from supply hopper into the throat without danger of clogging. Of structural steel construction. *Wm. Demmler & Bros.*

For more data circle No. 15 on the card below.

Differential flow meter

Especially suited to industrial furnaces, newly designed low-differential flow meter measures air flow, gas flow, and records ratios of air flow to gas flow. Two flow elements can be provided to measure and coordinate combined gas-and-air flow records. Dry diaphragm type measuring element eliminates need for water, oil, or mercury, and no leveling is required. Element accommodates static pressures to 10 lb and differential pressures to 20 in. of water. Unit construction permits removing parts without affecting calibration. Frame pivots for easy removal of internal parts without special tools. To simplify reading flow a cam is incorporated to translate square root relationship between differential pressure and flow to equal-increment flow record. *Hays Corp.*

For more data circle No. 16 on the card below.

Reader Service Dept.

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Material handling

Adaptability to many hot-metal handling requirements is stressed in four-page folder describing Ohio Tramrail system. Diagram shows how work processes, photos illustrate typical installations. *The Forker Corp.*

For more data circle No. 17 on the card below.

Gear Materials

"Modern Trends in Nickel Steel and Cast Iron Gear Materials," and *"Two New Gear Materials"* abstracted from papers presented before American Gear Manufacturers Association, give detailed analyses of gear properties, machinability, strength, and other characteristics. Photos, diagrams, and tables are included. Prepared for purchasers of replacement gears and for design and production engineers. *International Nickel Co., Inc.*

For more data circle No. 18 on the card below.

Hydraulic cylinder

Engineering, design, construction, mounting and dimensional data are given for full line of space-saving, square-design hydraulic cylinders for 2000-3000 psi operation. Information is presented for quick reference. Many diagrams, tables, photos illustrate and explain operation and maintenance. *Miller Motor Co.*

For more data circle No. 19 on the card below.

Electrodes

Folder describing Nickel-Arc 60 electrodes for welding cast iron illustrates typical instances of salvaging faulty castings by welds. Includes data on properties of electrodes and advantages of using the described make. *Alloy Rods Co.*

For more data circle No. 20 on the card below.

Sand-resin mixes

To help users of shell-molding process obtain uniform blend of fine sand and phenolic shell-molding resins, four-page bulletin explains and illustrates how to blend resin-sand mixes, gives information on charge, order of charge, mixing time, and discharge characteristics of sand and resins mixed for shell molding in the Twin Shell Blender. *Patterson-Kelley Co.*

For more data circle No. 21 on the card below.

Meehanite metal

To show the scope of application of Meehanite metal as material for castings is aim of 32-page booklet, which also gives tables of the physical properties of the various types of materials available. Also offered is a sound-slide film designed for showing to engineering groups, employee meetings, and others interested in use of such castings. *Meehanite Metal Corp.*

For more data circle No. 22 on the card below.

Cleaning equipment

Two booklets show results of mechanizing foundry cleaning departments together with a full description of the equipment used. Superiority of mechanical over hand operations is illustrated. *Pangborn Corp.*

For more data circle No. 23 on the card below.

Bonding agent

Superior flowability and less gumminess and tendency to clog conveyors, hoppers, and other equipment are advantages claimed in four-page pamphlet describing Panther Creek bentonite. Drawings contrast improper and recommended foundry practices. *American Colloid Co.*

For more data circle No. 24 on the card below.

Drum sander

Polishing wheel with self-tightening core for holding strip abrasives is pictured and described in four-page brochure. Time and cost-saving advantages over solid wheels explained. *Carborundum Co.*

For more data circle No. 25 on the card below.

Disc grinding and abrasives

Information on types of grains and bonds, coolants, disc speeds, mountings, and a guide to grinding various metals are presented in a 54-page photo-illustrated guidebook aimed at producing better surface grinding results. Marking codes, care of discs, and other data are included. *Gardner Machine Co.*

For more data circle No. 26 on the card below.

Wire rope slings

How to select slings and choose fittings is told in 108-page pocket reference book, which illustrates important types of wire rope slings and their uses. Book also contains tables showing safe loads, and offers information on gauging, seizing, and splicing wire rope. Also contains information about attaching clips, and preparing rope ends. *Rochester Ropes, Inc.*

For more data circle No. 27 on the card below.

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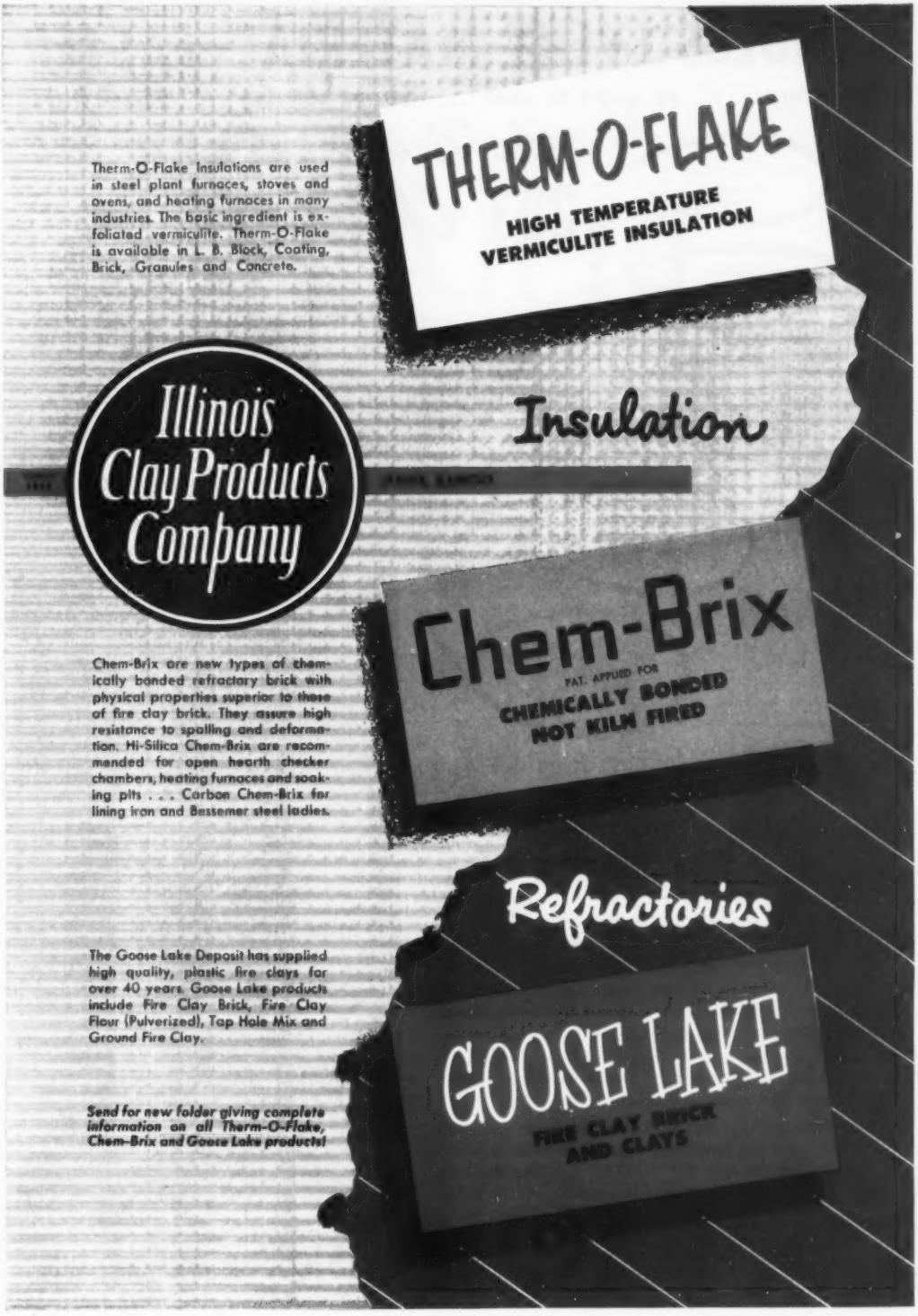
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12 CUBIC FOOT BUCKET (AT WATER LEVEL)

360° OPERATOR VISIBILITY WITH BUCKET IN CARRYING AND DUMPING POSITION

NO GEARS TO SHIFT. SIMPLY PUSH ON FOOT LEVER FOR FORWARD AND REVERSE

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PNEUMATIC FRONT TIRES. ALSO DESIGNED FOR SOLIDS. TWO SOLID STEERING TIRES

HIGH STEEL SEAT BACK PROTECTS OPERATOR. FITTED BACK RESTS AND SPONGE RUBBER SEAT FOR COMFORT

Agile as a cat — the NEW BUTLER 203 Carscoop — always the world's fastest boxcar unloader — today is even faster, turns shorter and carries a bigger load. In short, the BUTLER 203 offers a larger slash in your material handling costs.

The 203 Carscoop is like an extra pay check in general platform and factory floor work. But the dividends really pour in where you have very "tight quarter" operation. Boxcar unloading the BUTLER 203 handles as if it was born for it — which it was!

The big 12 cubic foot bucket nets a lot of material per trip; faster forward and reverse speeds *plus* faster, shorter turns means more trips per day.

Balanced steering, literally finger tip — even when the 203 is standing still, is a joy to the operator, actually encourages him to set new records.

And let's not forget that high steel seat back. Not only comfort but a big protection when floor traffic is heavy. Write us for the new 203 BUTLER Carscoop Bulletin. Just a postcard will get immediate attention. Write today!

Sales Agents in all Principal Cities and Free Countries

The BUTLER 203 Carscoop saves tremendous manpower in foundry materials handling.

The BUTLER 203 Carscoop can pile it high.

Literally darts in and out of boxcars.

BUTLER BIN CO.-*CARSCOOP DIVISION*-Waukesha, Wis.

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Let Pangborn prove, at no cost to you, why you should

SWITCH TO MALLEABRASIVE®*

(SHOT AND GRIT)

for the LOWEST OVERALL CLEANING COSTS you've ever had!

THAT'S RIGHT! Pangborn is prepared to prove to you that Malleabrasive does a better cleaning job at lower overall cost than any other abrasive you've ever used! Here's a challenge you can't afford to pass up! Pangborn will test Malleabrasive *in your plant* for 30 days, without any cost to you. Your machines will be expertly adjusted by Pangborn engineers to get the greatest benefit from Malleabrasive. Your work schedule will go on uninterrupted, while this fair, scientific test is being run. At the end of 30 days, you'll have your proof!

We *know* we can convince you, because we've *already proved* Malleabrasive in foundries all over the country. What's more, since Pangborn *makes* blast cleaning machinery, we have tested *all* the abrasives, to determine the best. Malleabrasive won on all counts!

The *original* premium abrasive, Malleabrasive has approximately 50% longer life than other premium abrasives—2 to 4 times the life of ordinary abrasives. It reduces down-time and protects your investment because Malleabrasive makes machinery parts last longer. It turns out perfectly cleaned castings *every time*, and actually costs far less per ton of castings cleaned!

Don't just take our word for it! Let Pangborn engineers run this impartial test in *your* shop. For more information, write to: PANGBORN CORPORATION, 1300 Pangborn Blvd., Hagerstown, Maryland.

Malleabrasive Guarantees
Lower Cleaning Costs
and Better Cleaning Jobs
Than Any Other Abrasive!

Packed in orange striped 100-pound bags

Look to Pangborn for the latest developments in Blast Cleaning and Dust Control equipment

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BLAST CLEANS CHEAPER
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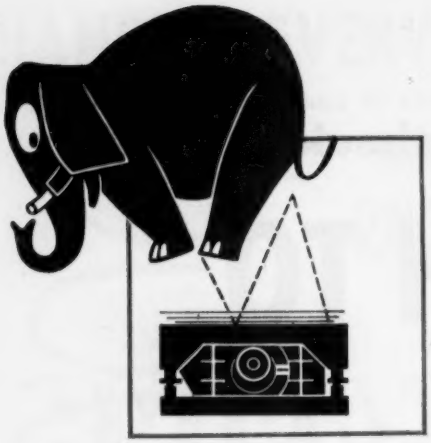
*U.S. Patent #2184926 (other patents pending)



SIMPLICITY SPRING-MOUNTED SHAKEOUTS GIVE YOU MORE ACTION TO THE TON

Foundrymen know that it takes plenty of "live action" to knock out cores and shake the sand from flasks and castings that sometimes weigh 100 tons or more. Simplicity Spring-Mounted Shakeouts do this job thoroughly in less time because of the controlled vertical action that's concentrated at the deck where the action will do the most good.

Simplicity's controlled vibration is the secret. In Simplicity Spring-Mounted Shakeouts, vibration is confined to the deck alone. The rigid supporting structure of the shakeout will not vibrate even with a light foundation.

Up on the live deck, you get positive controlled vertical action because of Simplicity Shaft Design and Special Corner Snubbers. This means absolutely no casting travel towards one end of the deck — a dangerous hazard if the casting or flask slips its chains. Flasks last longer and more important, casting damage is completely eliminated.

The massive deck and body construction of Simplicity Spring-Mounted Shakeouts insures dependable operation and lasting service, cuts maintenance costs to a minimum. Available in all larger sizes for use as single units or in combination. For complete information write today to . . .

Simplicity 8' x 10' Model OA Special Spring-Mounted Shakeout

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Simplicity
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ENGINEERING COMPANY • DURAND, MICHIGAN

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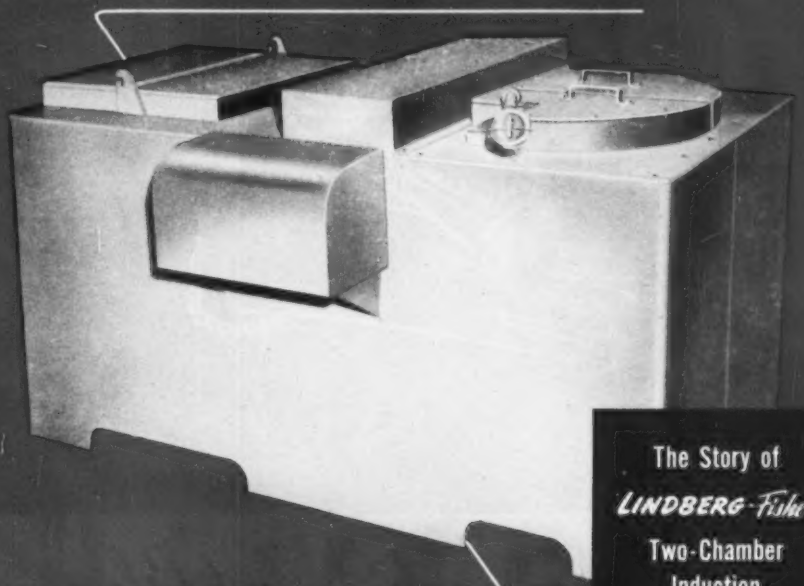

The Story of LINDBERG-Fisher Two-Chamber Induction Melting Furnaces

Get your copy of Bulletin 560. It tells how Lindberg-Fisher two-chamber construction combines the functions of melting and holding furnaces.

- . . . permits charging cold metal without disturbing temperature conditions in ladling or pouring chamber.
- . . . confines impurities to the charging chamber.
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- . . . minimizes metal losses because the metal is heated from the inside out.
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Hundreds of Lindberg-Fisher two-chamber induction melting furnaces are in use in all parts of the world. There's a reason . . . and it's worth investigating. Ask for a copy of bulletin 560. Use this coupon.

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Please send me a copy of your new 12-page bulletin, "Lindberg-Fisher two-chamber induction melting furnaces".

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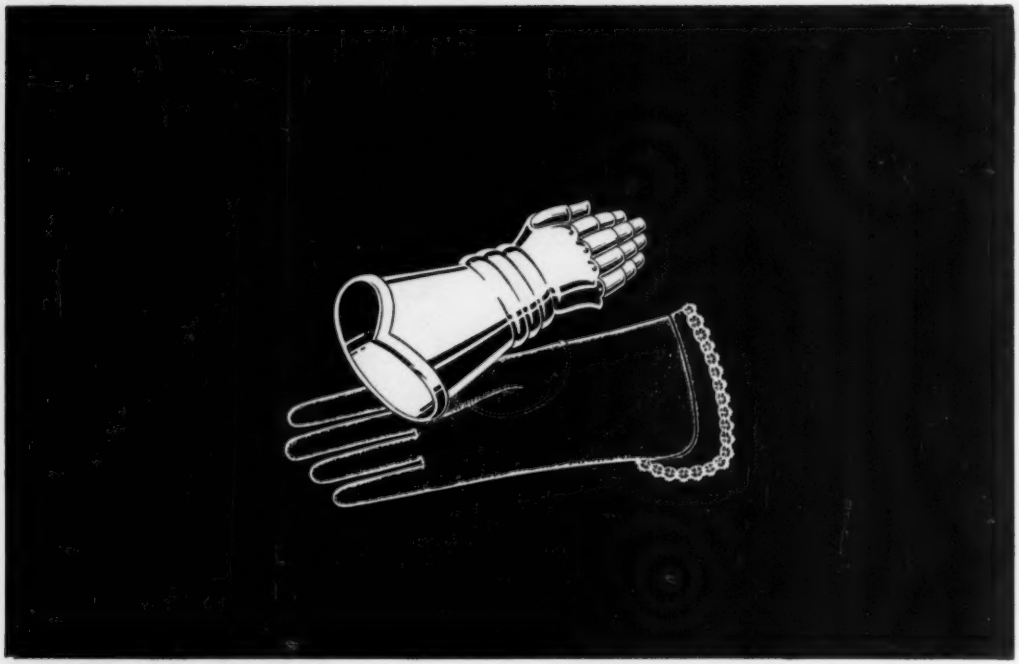

THE IRON FIST IN A *Velvet Glove*

Supposing—just supposing—YOU could write the specifications for an ideal blastcleaning chilled shot and grit. What qualities would you specify? You'd want it to be hard, of course, so it would clean fast. But you wouldn't want it so hard as to wear out your equipment at a rapid rate. Neither would you want the shot to be hard AND BRITTLE.

The ideal chilled iron shot and grit would be hard enough to do a fast cleaning job. And, if possible, you would want the hard iron carbides (that do the cutting) imbedded in some soft material that would go easy on your equipment and keep the shot from shattering into small ineffectual fines. What you would want is a sort of an "iron fist in a velvet glove" kind of shot and grit.

It may come as a surprise to you that there *is* such a shot and grit made. A chilled iron shot that holds the iron carbides in a *ductile matrix*—a shot that is hard enough to clean fast, yet soft enough to spare equipment and keep the shot from shattering too quickly. It is National Controlled "T" Shot and Grit.

We're not going to make any wild claims—we know YOU can appreciate the advantages of such shot and grit—providing what we say is true. And we'd like to prove our case *in a matter of minutes*—if you'll let us. Please write your name and address on the lines below and mail the coupon to the nearest Hickman-Williams office. The most you can lose is the cost of postage, but you may profit to the tune of a substantial sum of dollars.

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● Only Reichhold's research and production facilities (international in scope), plus a close acquaintance with foundry practice make possible Foundrez 7500, the new RCI powdered phenolic resin for producing lower cost shell molds. A pioneer in the development of synthetic resins, Reichhold now offers the foundry industry the same realistic prices and up-to-the-minute technical service which have benefited RCI customers since the company founding. For complete details about Foundrez 7500 for shell molds, write

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Two of five!

Detroit ROCKING Electric Furnaces build long service record—melting bronze for the Jeffrey Company foundry

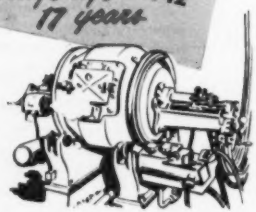
At The Jeffrey Manufacturing Company, Columbus, five Detroit Electric Furnaces have made excellent records melting bronze for worm wheels, bearings, bushings, electrical contacts, and pressure-type castings. In hundreds of other foundries, Detroit Furnaces are doing equally outstanding jobs melting bronze, iron, and steel alloys.

Detroit Rocking Electric Furnaces turn out fast melts of uniform high quality metal. Close control of analysis produces metal of desired analysis time after time, with optimum use of power. The melts are homogeneous, thoroughly mixed by the rocking action of the furnace. Electrodes are free of the molten metal at all times, reducing carbon pick-up to an absolute minimum.

Long life of Detroit Electric Furnaces is documented by such installations as that shown. Economies are proven, too—accomplished by full use of power, less heat loss, reduced metal shrinkage, more heats per day, less metal waste per melt, and reduced out-of-production time because of longer refractory wear and easy shell replacement.

Detroit Rocking Electric Furnaces are tailored to your operating needs. Capacities from 10 to 4000 pounds, for ferrous and non-ferrous melting.

1 350 lb. furnace installed 1925
1 350 lb. furnace installed 1925
1 350 lb. furnace installed 1937
1 700 lb. furnace installed 1941
1 700 lb. furnace installed 1942
average age 11 years



Better melts, faster melts—rocking action does it! Get the facts on what Detroit Rocking Electric Furnaces can do for you! Send us your data now!

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC COMPANY, BAY CITY, MICHIGAN

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"TASK FORCE 'KEOKUK' AWAITING ORDERS, SIR!"

CHIEF KEOKUK: . . . and ready with Electro-Silvery to help industry attack problems of iron and steel production . . .

PRINCESS WENATCHEE: . . . like helping to make the metal that went into this tank and other products vital to the defense program . . .

CHIEF KEOKUK JR: Hey, Pop, what *is* Electro-Silvery?

CHIEF KEOKUK: Electro-Silvery, Son, is a form of ferro-silicon that acts as a vital control element in the production of iron and steel . . .

PRINCESS WENATCHEE: . . . and the largest producer in the world of this vital ingredient is Keokuk Electro-Metals Company!

Keokuk Electro-Silvery is used by foundries and steel plants in the form of these three pigs, weighing 60 pounds . . . 30 pounds . . . and 12½ pounds.

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SALES AGENTS: MILLER AND COMPANY
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915 Olive St., St. Louis 1, Missouri

Foundrymen in the news

Howard A. Stockwell, past president of Gray Iron Founders' Society, and for many years chairman of the New England Cost Group, was honored at a recent meeting of NECG by the presentation of a plaque for his outstanding service to the cost group and the gray iron foundry industry. Mr. Stockwell has always been an advocate of sound cost methods and has considered cost work one of the most important functions of the society. He organized one of the first local cost groups in the East.

Andrew E. St. John was elected president at the annual stockholders meeting of Alloys & Products, Inc., New York, to succeed Henry Hecht, deceased. In addition to his duties as president, he retains his post as treasurer of the company. At the same stockholders meeting **C. A. Hecht** was elected vice-president, and **Wilson Hecht** was made a member of the board of directors.

Arthur J. Tuscany, Jr., has joined the Arthur J. Tuscany Organization, a management firm headed by his father which represents the Foundry Equipment Manufacturers' Association, Inc., and the Steel Kitchen Cabinet Manufacturers' Association. He brings to his new post diverse experience gained from five years as staff executive with two Cleveland metal trades associations. As part of his training he studied economics and business administration at Duke University for three years, and completed several engineering courses at the University of Michigan and University of Nebraska. After cessation of Japanese hostilities he remained with the Army in China to instruct Chinese officers in the use of American electronic equipment. **Arthur J. Tuscany, Sr.,** has been executive secretary-treasurer of FEMA for 18 years and has been active in foundry trade association work for more than 30 years.

Mme. Adrienne R. Weill, visiting French scientist, and **Dr. John P. Neilsen,** head of the metallurgical laboratories of New

Mme. Adrienne R. Weill . . . here from France.

York University's College of Engineering, discuss the operation of a dilatometer. Mme. Weill is studying American research methods in the metallurgical laboratories of NYU and other universities in this country.

Daniel T. Wellman succeeds his father, F. S. Wellman as president of Wellman Bronze & Aluminum Co., Cleveland. F. S. Wellman becomes chairman of the board.

J. D. Greensward was named vice-president, director of manufacturing, general machinery division, at a recent board meeting of Allis-Chalmers Mfg. Co., Milwaukee. **Robert L. Halsted** was appointed manager of the company's central region with headquarters in Cleveland. He succeeds **P. F. Bauer,** recently named general manager of the company's Norwood (Ohio) Works, and manager of the apparatus department. **Joseph Bronaugh,** manager of the Miami office since 1946, succeeds Mr. Halsted as manager of the Cleveland district office.

Willis L. Manning, research pioneer in the field of sound control, has been elected president of the National Noise Abatement Council. Mr. Manning, who is president of Burgess-Manning Co., Libertyville, Ill., was associated for many years with the late Dr. C. F. Burgess in the discovery and development of early sound absorbing materials. He has been active in the affairs of the council since its inception in 1940. The council has been set up to conduct a nation-wide educational campaign aimed at reducing excessive noise in streets, factories, offices and homes, and plans to extend this effort during the coming year.

Harold C. Olson is the new works metallurgist for the Los Angeles plant of Lindberg Steel Treating Co. He was formerly works metallurgist at the Melrose Park, Ill., works of International Harvester Co. Chicago.

Bernard N. Ames, chairman of the brass and bronze division of A.F.S., will prepare the 1953 official exchange paper from A.F.S. to the Institute of British Foundrymen. Subject: *"Shell Molding."* One of the pioneers in shell molding in this country, he is well known to A.F.S.

Arthur J. Tuscany, Jr. . . . . joins his father.

Daniel T. Wellman . . . new foundry president.

Bernard N. Ames . . . will prepare A.F.S. paper.

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members for his many talks and for his frequent contributions of technical papers. His most recent AMERICAN FOUNDRYMAN article was *"Metallurgy of Shell Molding,"* written in collaboration with **S. B. Donner** and **N. A. Kahn** which appeared in the January 1952 issue. Mr. Ames is senior metallurgist at New York Naval Shipyard.

Donald L. Colwell, director of laboratories for Apex Smelting Co., Chicago, tells how high strength is achieved in aluminum alloy castings without heat treatment on page 60. Examples of castings

Donald L. Colwell . . paper on aluminum alloys.

produced and the metallurgical explanation of their properties make his story particularly informative. He has a long record of activity in technical societies and has presented many talks and prepared many papers on die castings and light metals. During the last war he served with the War Production Board. In 1945 he was sent to Japan by the U.S. Strategic Bombing Survey and in 1949 travelled to Europe for the Economic Cooperation Administration.

James H. Baldrey has been appointed supervisor of melting for Cooper Alloy Foundry Co., Hillside, N. J. He has been associated with Allegheney Ludlum Steel Co., Watervliet, for the past 18 years. Currently president of Electric Metal Makers Guild, Mr. Baldrey is well known for his interest in problems encountered in melting stainless steels and for his methods of systematized controls leading to minimum rejects and highest quality. According to Cooper Alloy's works manager, **W. P. McKown,** the appointment was prompted by recent pioneering developments by the company in both centrifugal casting and shell molding and the concurrent expansion in furnace capacity.

C. J. Pruet, chief industrial engineer, McWane Cast Iron Pipe Co., Birmingham, Ala., gives advantages and principles of a sound wage incentive system in his article on page 58. He tells how a good system gives control over costs and gives payment to workers on the basis of results. A member of the Time-study and Methods Committee of A.F.S., Mr. Pruet prepared the paper as a contribution of that committee to the foundry industry.

R. L. Lloyd has been appointed general manager and **R. A. Wheeler** assistant general manager of advertising in a consolidation of the advertising sections of Nickel Sales and Inco Nickel Alloys Depts., of International Nickel Co., New York.

Wilbur S. Walters is one of the first to disclose shell mold and shell core practices used in a foundry producing com-

Wilbur S. Walters . . . tells shell mold practice.

mercial castings. Particularly unusual is the fact that in many instances he uses existing pattern and core box equipment. His story (page 42) was told first at this year's Metals Casting Conference at Purdue University October 30-31. Mr. Walters heads LaGrange Shell Molders, Inc., LaGrange, Ind.

J. S. Kirkpatrick, director of research and development, Brooks & Perkins, Inc., has been elected president of the Magnesium Association for the coming year. **W. C. Murray,** Utica Radiator Corp., Utica, N. Y., was elected vice-president, and **R. D. Taylor,** Federated Metals Div., American Smelting & Refining Co., was elected treasurer.

Amos J. Shaler has been appointed professor of metallurgy and chief of the metallurgy division of Pennsylvania State College. Professor Shaler who was an associate professor at Massachusetts Institute of Technology until his present appointment attended schools in Belgium and Switzerland, and received a BS and DSc at MIT.

Three of the five promotions made recently by Lynchburg Foundry Co., Lynchburg, Va., came through starts made in the company's apprentice school which for many years has provided much of the supervisory personnel. The men who came up by this route are: **James R. Bobbitt,** new chief plant inspector at Radford, **Waldo C. Watkins,** new chief plant inspector at Lynchburg, and **Fred W. Childress,** named sales clerk of the castings division. Other company promotions were: **Arthur P. Figg,** assistant works manager, Radford Div., and **Davis P. Ballowe,** assistant production manager, Lynchburg.

Philip H. Clapp, Jr., was appointed vice-president of Engineered Castings Div., American Brake Shoe Co., New York. He was formerly sales manager. Mr. Clapp joined the castings division in 1946 as an apprentice. Later he joined the sales department and subsequently was appointed sales manager. The company has also announced the appointment of **Kenneth A. Anderson** as director

Philip H. Clapp, Jr. . . . appointed vice president.

and **Joseph T. Gresh** assistant director of personnel services. Mr. Anderson joined the company in the purchasing department in 1944, and served also in the treasury department. In 1949 he was elected assistant secretary of the company and was appointed assistant to the vice-president in 1952. Mr. Gresh joined the company in 1946 and has been assistant to the treasurer since that date. His duties have included administrative work in the company's medical and safety programs.

E. G. Meiter gives three ways of controlling dust in foundries on page 53. His information is based on his association with metal casting plants as director of the Industrial Hygiene Div., Employers Mutual Liability Insurance Co. of Milwaukee, Wisconsin. The paper was taken from the recently-issued A.F.S. book entitled *Health Protection in Foundry Practice.*

Hiram Brown advises light metals foundrymen on how to select and maintain melting furnaces with his article starting on page 36. His story illustrates the more common types of furnaces, shows how induction furnaces operate, and gives the advantages and disadvantages of all types. Company chief metallurgist for Solar Aircraft Co., Des Moines, Iowa, he finds time to make numerous technical talks, write both technical papers and fiction, and in addition more than fill the role of a "paper a year" author for AMERICAN FOUNDRYMAN. His last article in "The Foundrymen's Own Magazine," which has stirred industry as well

continued on page 108

Our 70th Yuletide Message to Our Customers and Friends

We of Frederic B. Stevens Inc., wish you a most joyous Holiday Season and unbounded good fortune during the coming year.

We wish to thank you for entrusting your business needs to our organization. We are deeply grateful for the loyalty you have shown to us . . . and we are proud to count you among our friends.

So please accept these Holiday Wishes for health, happiness and good fortune . . . and add to them a sincere "Thank You" from all of us at Frederic B. Stevens Inc.

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"Our new 2F SIMPSON Mix-Muller $3,500.00 per year in materials and

. . . says Mr. Spencer Harris, plant superintendent
AMERICAN ABRASIVE METALS CO., IRVINGTON, N. J.

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In fact, when we first introduced the new 2F and 3F Simpson Mix-Mullers, management was frankly dubious that any new machine could out-produce their old No. 2 Simpson, and save enough to quickly amortize a new investment.

But once the decision was made to install a new 2F Mix-Muller, the results far exceeded their expectations. Here's what the new 2F unit has accomplished:

(1) *Permits the use of ALL synthetic sands;* (2) *Use of bonding materials cut by one-third;* (3) *Has eliminated all muller overtime—operator spends only 30 minutes cleaning area and machine;* (4) *Has reduced mulling cycle materially;* (5) *Has maintained highest casting quality—a MUST in producing flat work; and* (6) *An over-all saving in materials and labor of about $3500 per year.*

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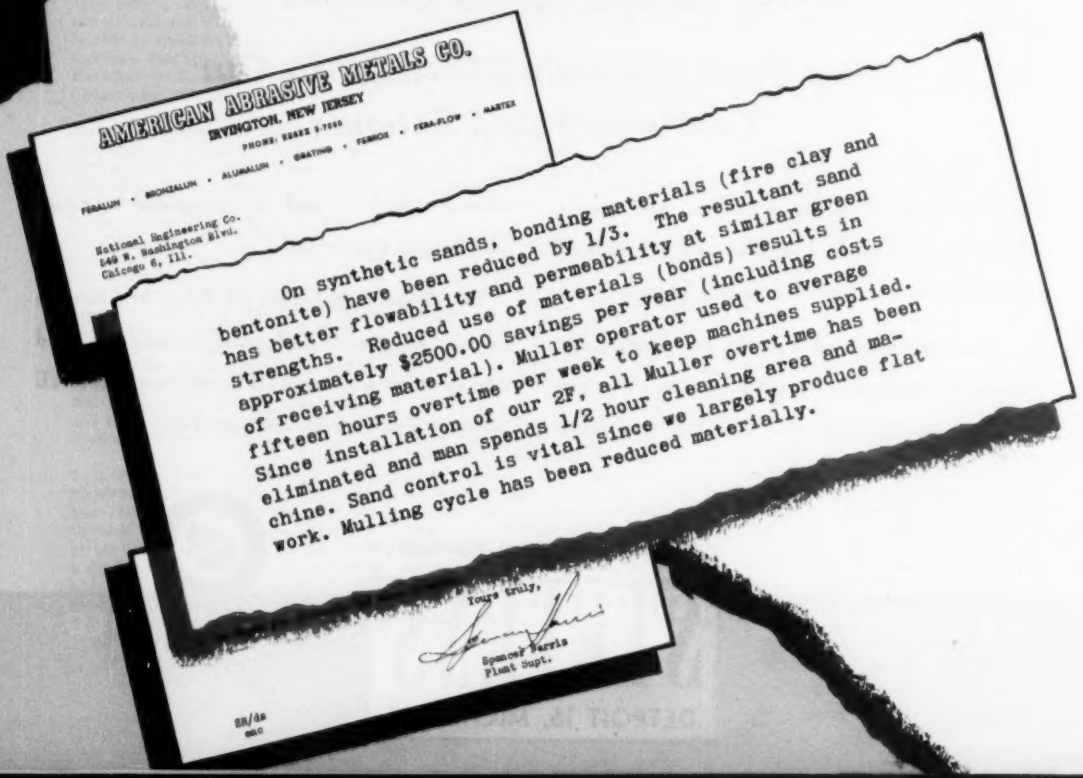
We think so, too . . . why don't *you* investigate the time and money-saving ability of the 2F and 3F Simpson Intensive Mix-Mullers? *Write for details.*



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3. Greater mulling speed—faster discharge.
4. Large batch capacity.
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Tilting-type Crucible furnaces in plant of Northern Pump Company at Minneapolis, Minnesota. Crucibles size No. 275; gas fuel is used with proportional mixers. Photograph courtesy of Northern Ordnance, Inc. A typical Crucible installation.

Stationary Crucible furnaces in the melting room of Fischer Casting Company, makers of bronze and aluminum castings, North Plainfield, N. J.

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trends

From art to science . . .

■ Foundrymen have been pointing out that foundry practice is developing from an art to a science for some 50 years—ever since large groups started in 1896 to get together to exchange ideas. Probably they were telling each other about the trend long before the end of the 19th century. And the trend, as rapid as it seems, will probably always be with us for as industry advances in its application of science, science develops new ideas and tools.

The foundry industry will never be all science . . . some art will always be involved . . . even application of scientific principles is an art.

While foundrymen are more interested in the present trend of the industry toward science, it is interesting to look back and see when the trend started. In his book *Development of the Metal Castings Industry*, Bruce L. Simpson tells how bellfounders sought a relationship between tone and size, shape, metal composition, and thickness. Thus a bell scale—perhaps the first instance on record of the foundryman and the engineer combining their skills for the production of perfect castings—was developed by the early Italian engineer-foundryman, Biringuccio.

Foundrymen today are contributing more and more to the production and utilization of castings through application of science. Working with them is an increasing number of engineers, and more engineering graduates are being hired by foundries each year.

The trend has been cause for concern on the part of some foundrymen. No doubt "Disturbed Foundryman," who wrote of his fears to AMERICAN FOUNDRYMAN (page 105, October), was speaking for a number of others. It is likely, too, that the foundrymen who replied (see Letters to the Editor, page 80, this issue) and those who called to ask "Did that letter come from my plant?" represent many others in their desire to reassure wondering employees as to the role of the engineering graduate in the foundry industry. Some of the letters have been published in their entirety with the expectation that they will allay worries that exist regarding the influx of young engineers by defining the part these young men are expected to play in the foundry world.

One concern, which stems from the desire to get ahead that most people have, is that the non-college man will be by-passed when promotions are made. The letters from foundry management indicate that this is not true and there is ample evidence to back them up in the news of promotions. Recent news from one plant shows that three of five promotions just announced were to former apprentices, while the other two men had worked in the plant for some time. A foundry manager called to say seven of the eight men just promoted in his plant had not gone to college.

Nor does this mean that only a few engineers are needed by the foundry industry. That founders cannot get enough men out of college to satisfy their needs is, in part, a reflection of faith in an expanded future for the industry. In this future, good foundrymen—college or non-college—are needed.

We recommend this month's Letters to the Editor to all types of trainees and to all foundrymen. The trend of the industry from an art to a science is as clear in the letters as it is in the foundry literature which has developed over the years. Also evident is the need for men who can move with the trend.

Advantages and disadvantages of

Light metal melting equipment

HIRAM BROWN / *Chief Metallurgist, Solar Aircraft Co., Des Moines, Iowa*

Good melting practice goes back to the selection of furnaces and pots. The equipment used and its care greatly influences the cost and versatility of melting operations. Factors in choosing equipment include purpose for which the metal is being melted, intended use of castings, their size, their quantity, and the variety of alloys to be poured.

■ Today a variety of furnace types are available for light metal melting. They may be divided into two general classes and subdivided into specific types which this article shall attempt to point out and illustrate.

The method of heating used may be dependent upon local conditions which may affect availability or cost of certain of the methods. In other cases the nature of the metal being melted may influence the choice.

Reverberatory furnaces (Fig. 1) have capacities from a few hundred to 100,000 pounds of metal. The melts are contained in a shallow basin immediately below the flame.

Furnaces for Light Metals

I. Fuel fired furnaces (gas or oil).
   - A. Direct flame furnace where products of combustion pass directly over charge.
     1. Reverberatory
     2. Stack charging
     3. Barrel
   - B. Indirect flame furnace in which products of combustion do not come directly into contact with the metal charge.
     1. Lift-out
     2. Tilting
     3. Stationary

II. Electric
   - A. Low frequency induction
   - B. High frequency induction

These furnaces are used primarily for the production of large quantities of metal, particularly for casting of ingots or for transferring to holding pots for permanent mold casting.

These furnaces are used extensively for smelting and refining of secondary metal. Because of the large amount of metal in each heat, composition is less sensitive to metal mixture and by sheer dilution will permit blending of scrap which would not be feasible in smaller furnaces. Furthermore, a wide range of scrap size can be used.

Continuous melting and casting of ingots or billets is possible with such furnaces. Small reverberatory furnaces with several dipping wells are sometimes used for permanent mold casting.

This type of melting is conducive to large quantities of dross, hard spots, and gas absorption. Such large heats are difficult to degas or to give special treatments. Furthermore, gas

Fig. 1 . . . Puddling the charge in the 20,000 lb oil-fired reverberatory furnace in the new aluminum and magnesium alloy foundry of a midwestern plant.

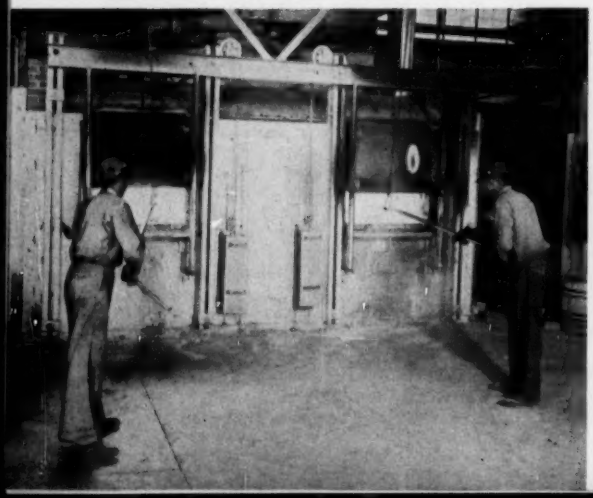
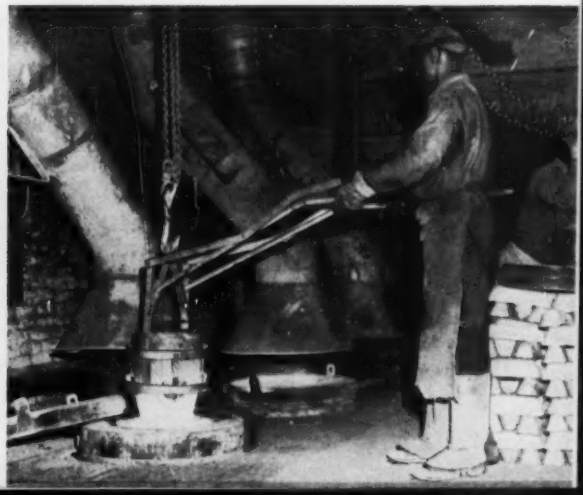


Fig. 2 . . . Removing a crucible from a pit type furnace in the melting room of the Metal Hose & Tubing Co., Dover, N. J. Photo courtesy of Joseph Dixon Crucible Co., Jersey City, N. J.



pickup is likely to occur in transferring this metal from furnace to mold. For these reasons this type of melting is not usually recommended for metal which is to be poured into castings.

In stack-charge reverberatory furnaces, the metal is charged into the furnace through a flue (see on page 42). Because of the combustion gases passing over the metal this type of furnace is regarded even less favorably for light metals than the usual reverberatory type where the metal is to be poured into castings.

Barrel furnaces rest on trunnions making it possible to rock or rotate the furnace slowly or tilt it for discharging the molten metal into a pouring ladle. They have been used for many years in brass and bronze foundries but are not used extensively in the United States for melting the light metals. These furnaces have low thermal efficiency, cause localized overheating of metal, and produce a large quantity of dross and hard spots.

Pit and tilt type furnaces

Pit type furnaces may be entirely below floor level or may extend partially above. This type of equipment is shown in Fig. 2. The crucible is placed inside the pit by means of tongs with or without use of an overhead crane, and is removed from the furnace in the same manner.

Pit furnaces offer several advantages for small foundry operation:

1. Installation is easy and cheap. Most foundries can build the furnaces themselves. The lining may be of fire brick, or of plastic refractory which can be rammed into place around a pattern used to shape the interior of the furnace.

2. Since the furnaces are below eye level it is easy to stir the metal, skim, or make any necessary additions with the metal in full view of the melter.

3. Castings are poured directly from the crucible in which melting is done, thus conserving heat and minimizing transfer of metal which helps to prevent dross and gas pickup.

4. Melting is very flexible particularly in regard to variety of alloys. A number of crucibles can be used interchangeably depending on the alloy being melted so that no contamination need occur when changing alloys.

5. Danger from splashing or spilling of metal in furnace is minimized due to fact that the hot metal will go into the pit and not onto concrete or damp earth floor where it might spit.

There are several disadvantages to the process:

1. The amount of metal melted is limited by the amount which can be lifted and poured without transferring to pouring ladles. Quantities of 50 or 100 lb are easy to handle, but 500- or 1,000-lb heats would not be practical.

2. Lifting of metal from pit is likely to be awkward, and unless hoists and couplings for lifting of pots are well designed the melter can be exposed to a great deal of heat.

In tilting type furnaces (Fig. 3), melting is done with the furnace in upright position, then the furnace is tilted for transferring metal to pouring ladles. They have capacities up to 3,000 lb and are widely used in aluminum foundries, but infrequently used in magnesium foundries. Either steel pots or refractory crucibles can be used. This type of melting offers several advantages:

1. Either small or large quantities of metal may be melted.

2. Good control of heat and melting operation can be maintained.

3. Transfer of metal to pouring ladles is easily done.

4. The amount of metal transferred can be controlled from very small amounts to the full capacity of the furnace.

5. Since these furnaces usually are all above floor level, fluxing and degassing fumes are generated above eye and nose level and can be vented with a minimum of irritation to operator.

There are also several disadvantages:

1. The metal must be transferred to pouring ladles and this introduces the possibility of turbulence and gas absorption.

2. To view the contents, to make additions, or to stir the metal the melter must work in an awkward overhead position with his hands, or must mount a platform to furnace-top level.

Stationary type furnaces

Stationary type furnaces may be partially or all above floor level. Non-tilting, they may have capacities of from a few pounds to several thousand pounds. They may be used for melting as is the case in magnesium foundries (normally 60 to 650 lb capacity), or for holding or

Fig. 3 . . . Filling ladle with molten magnesium alloy from tilting type furnace. Man at left has scoop of powdered sulphur ready to smother burning metal. Photo courtesy Dow Chemical Co., Bay City, Mich.

Fig. 4 . . . Stationary holding pot for treating metal. At left rear is tilting furnace for melting. Note hoods to remove heat, fumes, and burned gases.

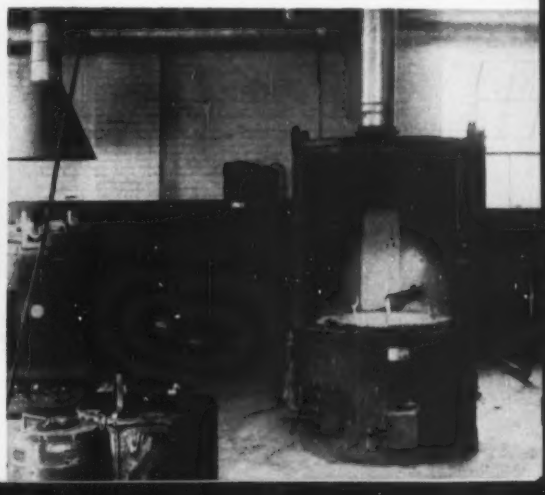


Fig. 5 . . . 550-lb crucible of molten magnesium in rig for pouring casting. Transfer of metal was eliminated by melting in metal pot. Photo by Dow.

treating metal transferred from tilting or reverberatory melting furnaces. The crucible or pot may be lifted from the furnace for pouring or metal may be ladled from the furnace depending upon the type desired. In aluminum foundries they are very useful where further treatment is necessary before casting. These treatments may be carried out in the holding furnaces without tying up the melting furnaces during treating periods as shown in Fig. 4.

Advantages, disadvantages

Figure 5 shows a 550-lb crucible of magnesium which has been lifted from the furnace and carried to the mold for pouring. Either iron pots or refractory crucibles may be used.

Advantages include:

1. Where the pot is lifted out for pouring no transfer of metal is required and turbulence and gas pick-up are minimized.

2. When used for holding metal for permanent mold casting or for treating metal before pouring it is necessary only to maintain temperature and thus installations are cheaper than for tilting furnaces.

3. Where permanent molds using the same type of metal but different pouring temperatures are involved, alloying can be done in a large furnace and different temperatures maintained in various holding pots.

4. Where the same type of metal but different treatments are required, the melting can be done in large furnace and different treatments performed in the various holding pots.

There are also disadvantages:

1. Where metal is ladled from furnace, dirt, oxides or contamination may be introduced by ladles.

2. Usually separate holding furnaces are necessary for each alloy being used since seldom is all of the metal used before another load is brought from the melting furnace, so there is a constant heel of metal in each furnace.

The energy required for melting metals in an electric furnace varies for a given metal or alloy with size of furnace, thickness of refractory lining, temperature of molten metal, rate of melting, and degree of continuity of operation of furnace. Electric furnaces may be of tilting or stationary type.

Induction furnaces

Low frequency induction furnaces range from 200 to 5,000 lb of aluminum. They are also known as the submerged resistor type. Figure 6 shows several in operation. They are the channel type where the molten metal in the channel acts as the secondary of the circuit. This is shown schematically in Fig. 7. A charge of liquid metal sufficient to fill the channel and thus complete the loop is necessary to start the furnace. When the channel and bottom of the melting chamber are filled with liquid metal a loop is formed. A laminated iron core passes through this loop, and a primary winding on this core completes a transformer with the molten metal in the loop as the secondary current. The metal in the channel is heated by the current induced in the loop and circulates continuously (see arrows in Fig. 7) and thus transfers heat to the body of metal in the chamber. This movement of liquid metal also stirs the liquid metal in the chamber.

These furnaces operate from normal frequency power sources (60 cycles), require 20 - 1,000 kw, and are controlled with voltage regulating transformers and contactors. They have capacities up to 8,000 lb of aluminum. The larger ones are used for melting scrap to pour ingots.

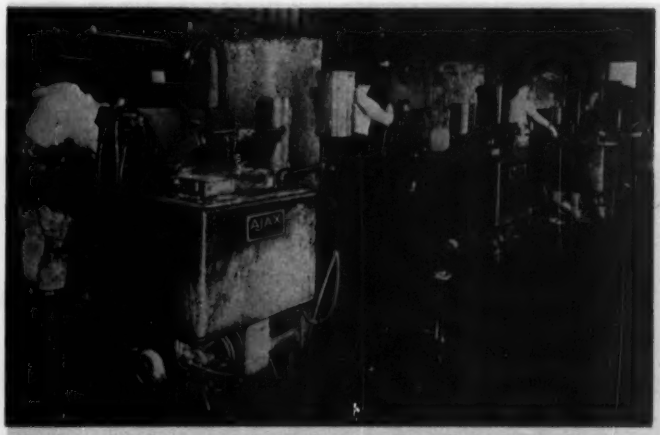


Fig. 6 . . . Low frequency induction furnaces. Also called submerged resistor type, they have a channel of molten metal at the bottom which forms the secondary of the electrical circuit. Courtesy Ajax Engineering Corp., Trenton, N. J.

When starting a new lining it is heated to a bright red heat in the lower channels with a gas torch or a strip resistance heater, and the molten metal is then added to fill the channel. It is necessary to maintain the liquid metal in the channels during the down period between melts using below normal voltage to hold the charge in liquid state overnight or over weekends. It is also necessary to empty the channels and clean them about once a week under full operation.

Electromagnetic pumping

Installation cost is high, at least half again as much as a fuel-fired, crucible type of the same capacity, but less than high frequency equipment. Because of the surging action of the liquid metal in the channel this type of furnace is not recommended for magnesium melting due to the danger of dross formation.

Production rate for melting aluminum is about 3½ lb per kw hr for an 8-hr day or 5 lb per kw hr for a 24-hr day. The lower rate for the 8-hr day is due to the necessity of maintaining molten metal in the channels even during down time. Melting efficiency is 10 per cent higher than that of high frequency melting for a 24-hr day but 10 per cent less than high frequency melting for an 8-hr day, also due to heel problem mentioned above.

Observation of the movement of liquid metals within the melting channels of submerged resistor furnaces led to the utilization of these electromagnetic forces for pumping molten metals at high temperatures. Normally (as shown in Fig. 7) the metal is forced out of the channels at the center of their cross section and attracted into the channels at the periphery. In the electromagnetic pumping device (shown schematically in Fig. 8) a refractory pipe is inserted into a section of the secondary circuit of an induction furnace where a high pressure is created by the second current. The outer end of the pipe leads to the outside of the furnace and serves as a pouring spout or nozzle capable of transferring molten metal to molds. This simple arrangement transforms the disorderly metal movement shown in Fig. 7 into a unidirectional flow as shown by arrows in Fig. 8. This has been used to pump metals into permanent molds or ingot molds.

Low frequency advantages

Advantages of low frequency induction furnaces are:

1. Low maintenance cost.
2. Reduced metal losses due to oxidation.
3. Improved metal quality due to lower gas pickup and absence of products of combustion.
4. Uniformity of metal composition due to automatic stirring.
5. Very clean operating conditions.
6. Metal can be pumped into permanent molds or ingots.

Among the disadvantages are:

1. High installation cost.
2. Inflexibility. Since molten heel must be kept in furnace at all times it is difficult to melt a variety of alloys due to problem of contamination.
3. Molten metal must be kept in furnace even during normal down time thus adding to cost.
4. Channels are difficult to clean.
5. It is more difficult and costly to replace lining than to change pots or crucibles in fuel fired furnaces.
6. It is necessary to transfer metal to ladles for pouring castings, unless electromagnetic pumping can be used.

High frequency furnaces

High frequency furnaces range from a fraction of a pound to 2,000 lb of aluminum in capacity. They operate on frequencies of 1,000 - 10,000 cycles and use 20 - 1,200 kw, requiring a motor generator as a source of power. Figure 9 shows a high frequency unit in operation. The furnace coil represents the primary, and the metal charge within the crucible (or the crucible itself) represents the secondary as shown schematically in Fig. 10. The furnace coil is a solenoid made of tubular copper, is cooled by passing water through it, and is protected by refractory which constitutes the crucible. The high frequency needed for the furnace is applied to the terminals of the furnace coil. Currents are induced in a charge of conducting material within a non-conducting crucible, or in a conducting crucible containing a non-conducting material, by the alternating electromagnetic field produced. These

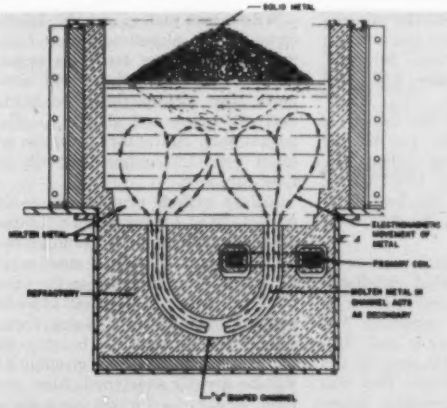


Fig. 7 . . . Cross-section of low frequency induction melting furnace showing movement of metal induced by current which also provides energy for melting.

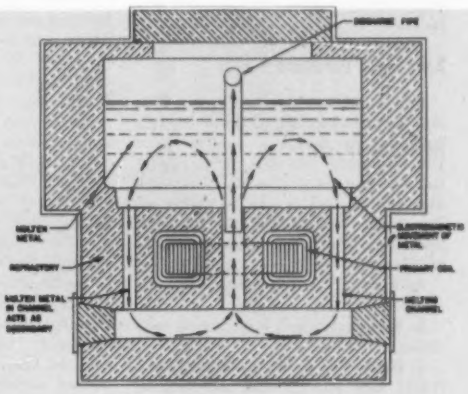


Fig. 8 . . . By putting a discharge pipe in the melting channel, low frequency induction furnaces can be made to discharge metal into molds.

induced currents (eddy currents) cause rapid heating of the metal to temperatures above the melting point. The heating depends upon the current applied and the resistance of the material to be melted. The higher the resistance the more efficient the heating in a given installation. The strong electromagnetic field also causes a stirring action within the molten metal producing uniformity of composition.

Production rate for melting aluminum is about 3½ lb per kw hr. Melting efficiency is 10 per cent lower than that for low frequency melting for a 24-hr day but 10 per cent higher than low frequency for an 8-hr day. This is due to fact that no molten metal heel need be maintained in the high frequency furnace and the entire charge can be emptied each time.

Due to high installation cost these furnaces are seldom used for aluminum melting. Although not used extensively in this country for magnesium melting this type of furnace would be suitable for this purpose.

This equipment is more expensive to install than low frequency equipment due principally to the need for a motor generator set, additional control equipment, and a large bank of capacitors to correct the inherently low power factor. This low power factor (10-15 per cent results from the separation of the primary circuit and the secondary which is due to the necessary thickness of the wall of the crucible.

The furnace shell may be lifted with a crane and moved to the pouring floor for direct pouring of castings thus avoiding metal transfer to ladles.

Lift coil furnace

For small foundry melting a lift-coil furnace has found favor. In this furnace the metal is melted in a free standing crucible. After melting, the furnace coil is raised and the crucible picked up in a shank or by tongs and carried to pouring floor. This type of operation has many points in its favor.

Advantages of high frequency induction melting include:

1. Reduced metal loss due to oxidation.
2. Improved metal quality due to lower gas pickup and absence of products of combustion.
3. Uniformity of metal composition due to automatic stirring.
4. Metal pouring can be done without any transferring to ladles.
5. Very clean operating conditions.
6. Flexible in regard to alloys since no heel is needed to start melting.

The two disadvantages of the furnace are:

1. High installation cost—even higher than the low frequency type.
2. It is difficult and costly to replace linings and furnace is out of use during repair unless spare shell is available.

Either iron pots or refractory crucibles are used for light metal melting. Many aluminum alloys tend to dissolve steel pots and the iron has a detrimental effect on the alloys being melted. For that reason clay-graphite and silicon carbide crucibles are greatly used for melting aluminum alloys such as those containing silicon and magnesium. Pit type crucibles are almost always of the refractory type.

Melting pot compositions

The proper alloy to be used for melting pots is a subject of much debate. The life of the pot must be balanced against its cost. The problem is essentially one of finding which material will melt a large quantity of metal at a low pot cost per pound of metal melted. Since operating conditions vary widely from foundry to foundry some experimenting is necessary for each individual foundry. Compositions range from plain gray irons to those containing various amounts of such metals chromium, nickel, and molybdenum.

Of the plain irons, those containing high total carbon will possess the better resistance to the alternate heating and cooling that the pot undergoes in use. A typical composition may be: Si 1.5 per cent, Mn 0.50, total carbon not under 3.50, and P less than 0.30.

Alloy cast irons of the following compositions are used: (1) Si 1.80 per cent, Mn 0.70, total carbon 3.25, Cr 0.50, Mo 0.50, and P 0.15; and (2) Si 1.00 per cent, Mn 0.65, total carbon 3.30, Cr 0.75, Ni 2.00, and P under 0.30.

Small additions of chromium seem to be beneficial, probably stabilizing the carbide and, thereby, retarding graphitization and reducing the tendency toward growth and distortion. Limited experiments by the author seemed to indicate that size and distribution of graphite flakes may be important. Small nickel additions seem to have effects similar to small chromium additions. High phosphorus is believed to cause rapid scaling; titanium addition seems detrimental.

Cleaning aluminum pots

Pots made with 25-30 per cent chromium will successfully withstand the temperature involved, but material cost is high and it is questionable whether their increased cost will offset the extended service life.

One item, however, is universal for aluminum melting pots and that is the need for careful cleaning and coating with a refractory wash before use and at frequent intervals thereafter. There are probably as many coatings as there are foundries. Most of them are based on a slurry made by mixing red or white talc with water and adding a little sodium silicate (water glass) for binder. One mixture commonly used consists of 6 gal of water, 12 lb whiting, 1 lb plumbago, ½ pt sodium silicate. Another consists of 1 part of lime to 1 part of water by volume. The wash can be sprayed on the pots while slightly warm or painted on with a wide brush. Avoid thick coatings, since they tend to flake and expose the metal underneath.

Before the wash is applied the pot should be thoroughly scraped and cleaned. If any pits of aluminum are left they will act as focal points to accelerate attack when molten aluminum is again in contact with that area. When pots are properly cleaned and coated the metal film should peel out freely when the pot is cold. After coating the pot should be carefully dried to prevent formation of scabs which could wash into the metal.

Where iron pickup may be deleterious to the aluminum alloy being melted, refractory crucibles should be used. Although these will eliminate iron pickup they are brittle and will crack and chip if handled too roughly. Refractory crucibles are often used in connection with pit type furnaces.

Silicon carbide crucibles have the advantage of having higher thermal conductivity than clay-graphite ones and heating is, therefore, more rapid. Clay-graphite crucibles, on the other hand, are easier to clean out after the melting operation. Oxidizing flames should not be used for heating silicon carbide crucibles or crucible life will be greatly shortened. Also, care must be exercised when using silicon carbide crucibles that pieces broken from them do not form hard spots in the castings.

Magnesium melts do not appre-

ciably dissolve steel, so steel pots are quite universally used for magnesium melting (Fig. 5). Either welded or cast steel pots are used. Welded steel crucibles usually have heavy bottoms which can be cut off and new bottoms rewelded, because this portion of the steel crucible is usually the first to fail. Cast steel pots are usually radiographed to make certain the castings are sound. The life of a steel pot can be increased considerably by metalizing the exterior with aluminum and diffusing the aluminum into the steel (e.g., colorizing). The steel used is low carbon steel such as boiler plate.

Pots for magnesium

One type available is reported to give pots which do not distort as much in service as do those made from boiler plate. The analysis of this steel is given as follows: C 0.08-0.15 per cent, Mn 0.90-1.25, P 0.09-0.13, Al 0.025-0.070, Si 0.03-0.08, S 0.05 max., Cu 0.10 max., Ni 0.10 max., Cr 0.10 max., and Mo 0.10 max. Note that copper and nickel are held to 0.10 max. to avoid contamination of the magnesium.

The failure to a pot of magnesium is fairly serious because it may mean a fire and damage to equipment. Therefore, careful inspection methods must be used to make sure the pots are in good condition. The large pots should be removed from service and inspected after more than 18 eight-hour shifts of operation. This inspection usually involves the removal of the pot and a thorough cleaning of the interior by filling the pot with water to dissolve the flux, scraping the interior down to the bare steel, and removing the scale with an acetylene torch and hammer.

The wall thickness of large pots is then determined by calipering them, and the smaller ones by testing with a ¾-lb hammer. Thin walled pots are discarded. The minimum permissible thickness for the bottom or walls of 2,000 lb capacity pots is about ¾ in. The smaller pots are tested every third shift, and if the walls or bottom are thin enough to be dented with a ¾-lb hammer, they are discarded.

Furnaces should be cleaned at the same time the pots are inspected. If iron scale accumulates in the furnace, a leak of magnesium may cause an explosion.

Thus far we have dealt with melting equipment. From this point on melting practice takes over—but that is another story!

Fig. 9 . . . Tapping a heat from a tilting, high frequency induction furnace. Though suitable, cost prevents these furnaces from being used more for light metals. Photo courtesy Tocco Div., Ohio Crankshaft Co.

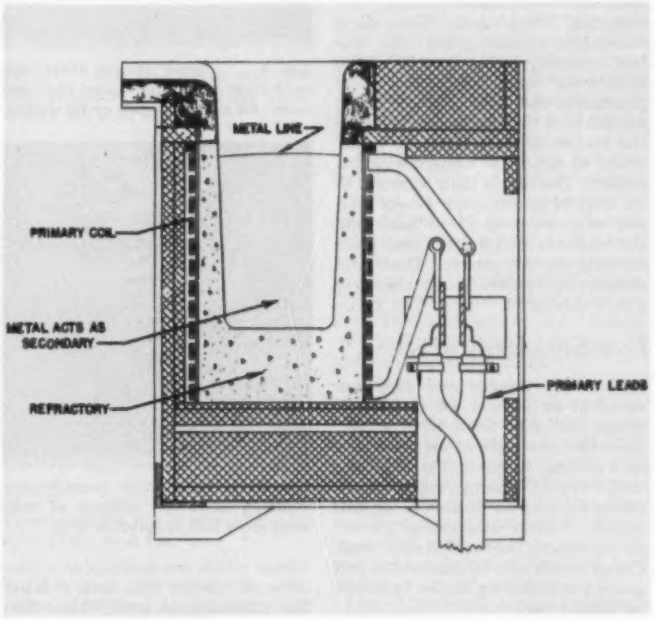


Fig. 10 . . . High frequency induction furnace uses metal to be melted as secondary in induction circuit. Rapidly alternating current develops eddy currents which melt and stir metal. Primary coil is water-cooled tubing.

Shell molding and coremaking adapted to the small shop

Shell molding is being practiced on an experimental basis by an unknown number of foundries. A few are in production and willing to talk about it. One of the shops in the latter category is run by the author. Long interested in producing castings in cores, he made the natural step to shell molding after studying the process and the equipment required.

WILBUR S. WALTERS / *LaGrange Shell Molders, Inc., LaGrange, Ind.*

■ Shell molding consists, briefly, of dumping a mixture of sand and phenol-formaldehyde resin upon a heated metal pattern clamped to a dump box and allowing the heat of the pattern to soften the resin, producing a thin shell. The process at LaGrange Shell Molders starts with heating the pattern to 375 to 500 F, spraying it with liquid parting, then clamping firmly upside down on a dump box containing the mix. The box is quickly inverted, allowing the mix to fall upon the pattern. Heat penetrates and softens the resin to a depth of ⅛ to ½ in., depending upon the length of time the mix is allowed to remain in contact with the pattern. The box is then returned to its original position, the excess sand and resin mixture drops back into the container, and the thin shell mold remains on the pattern. These and subsequent operations are shown in Fig. 1 through 6.

Pour immediately or later

Next, the pattern and shell are cured in an oven at 600 to 1,000 F, which may take from 30 to 60 sec. Then shell and pattern are separated on a stripper machine. The resulting shell has good strentgh, rigidity, permeability, and an unusually smooth surface. Surface smoothness is a result, primarily, of the fine sand used. Cured molds can be assembled and poured immediately or can be stored for future use.

Many small run jobs are being overlooked, especially by small foundries. The long run jobs look lucrative to the operator of a small shop, but they require special machines which can produce at a phenomenal rate per man-hour of labor. The machines are costly, since they range from several thousand dollars for machines that are quite limited in casting size, to $13,750 and up for single-station machines or multiple-station machines available.

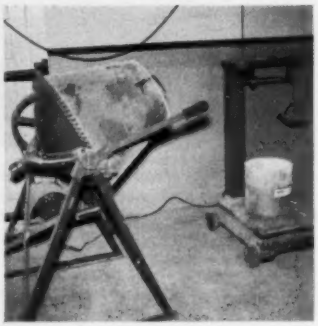


Fig. 1 . . . Small cement mixer with tight cover is used for mixing sand and resin. All mixtures made up by weight.

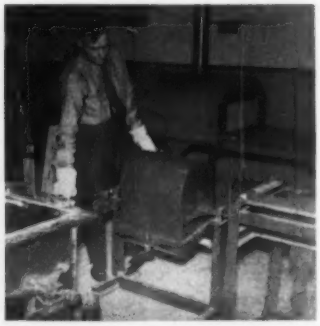


Fig. 2 . . . Operator inverts small dump box to throw sand and resin mix onto hot pattern. Oven is in background.

Fig. 3 . . . Pedal raises round-headed stripping bolts for removal of shell after mold half is cured in oven.

Fig. 4 . . . Iron is melted in oil-fired, stack-charge reverberatory furnace located at end of 40-mold roll conveyor.

Many castings difficult to produce in green sand can be produced better and less expensively by the shell mold process. Cope and drag equipment of pressure-cast aluminum plates equipped with push-off pins and locators may well be used with success for short-run jobs. Tempera-

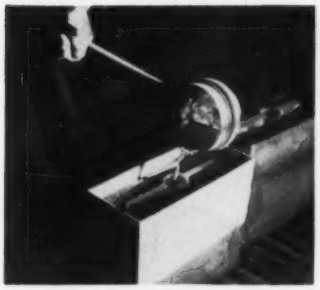


Fig. 5 . . . Larger iron castings are poured in shells backed with shot. Aluminum is poured here for demonstration.

Fig. 6 . . . Lighter castings are poured without backing. Paste type adhesive is preferred at LaGrange Shell Molders.

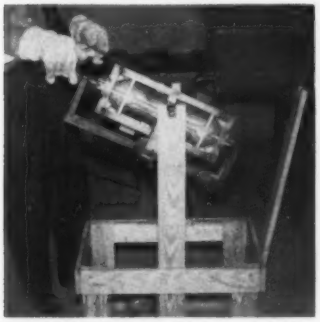


Fig. 7 . . . Fixture for rotating core box about two axes. Box is first heated to 425 F in oven in background.

Fig. 8 . . . Removing baked shell core from core box. Shell cores are cured in oven like shell molds.

Fig. 9 . . . Packing shell cores for shipment. Cores are wrapped in soft material to insure safe arrival.

Fig. 10 . . . Shell cores awaiting packing for shipment. Cores were originally made singly as in Fig. 18.

ture will be more critical for aluminum than for ferrous metals, and the plates work better when held to a temperature of 400 to 425 F to insure the least possible distortion of the pattern due to expansion of the metal.

It has been found also in pressure-cast aluminum plates that excessive heating of patterns having numerous small pockets softens the metal, and the sand-and-resin mix will adhere to the pattern and break off when the shell is stripped. One such casting has been successfully cast from a 20 x 20-in. pressure-cast, cope and drag pattern. This casting has four cored holes, deep pockets to draw, and weighs 27 lb as a green sand casting. The shell mold casting weighs 25 lb and requires pouring a total of 27 lb of metal as compared with 49 lb for the same casting in green sand.

The scrap percentage was very high for the green sand casting and shifts, swells, scabs, blows in the cored bosses, and chilled surfaces, as well as heavy risering, made this a difficult job. The shell mold casting has eliminated these hazards as well as allowing relocation of cored holes to meet blueprint dimensions. The removal of 0.100 in. of stock from machined surfaces facilitates more rapid machining of the casting and results in savings on tool costs.

Shell coremaking

Shell core making has not progressed as far as shell molding. However, it is possible to make fine cores using the usual shell mold mix. The core box, usually a split box, with a suitable opening through which the mix may be introduced, is heated within the range of 400 to 500 F. The core box is clamped to a suitable container which holds the resin mix and the entire unit is inverted to allow the mix to coat the inside surfaces of the core box. Some shaking or vibrating may be necessary to insure that all irregular contours of the box are properly coated.

After 10 to 30 sec, the box and container are returned to their original position, allowing the excess sand to fall back into the sand box. The core box is removed, placed in the oven and brought up to the proper temperature in the 400-500 F range. Thirty to 40 sec should suffice for the cure. The box is opened and the shell core removed. Figures 7 through 10 show shell core production.

These cores have a wall thickness of ⅛ to ½ in., depending upon the type of casting in which they are to be used and the metal poured. The cores are strong and accurate with sharp detail, are light to handle, unaffected by moisture, highly permeable, and may be stored for a long time. The cores collapse readily in use and produce castings with exceedingly smooth surfaces.

One of the castings being produced by the author is shown in Fig. 11. The left portion is half a mold for a flat iron shoe. The sprue has a distinct taper and the runners are severely choked. The small risers take off gas pressure and insure a sharp

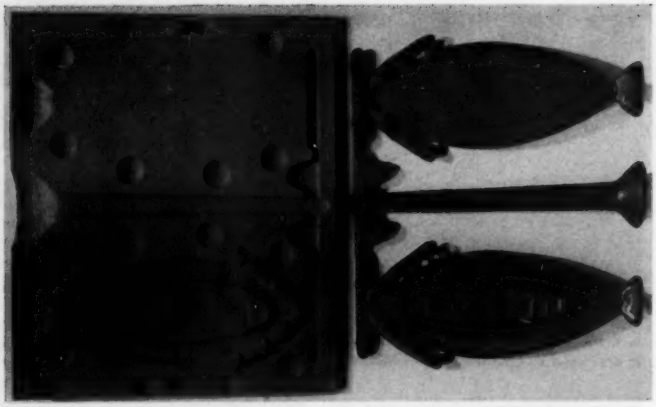


Fig. 11 . . . Half shell on its side shown with flat iron shoe castings it produces.

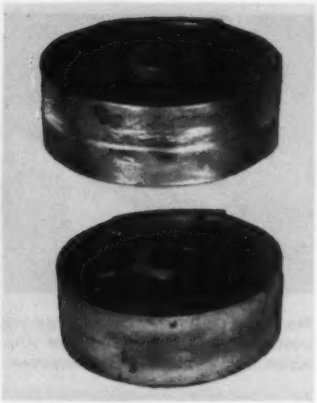


Fig. 12 . . . Upper caster had fin filed.

edge. Originally, the gating included two flat lap gates on the flat of the sole. These would break clean, leaving a small portion of gate to grind off the flat. The gating pictured is wedge-shaped, but since it has a tendency to break into the sharp outer edge of the iron, new gating has been tried. It comes directly off the sprue into a trap and is severely choked. A wide, thin in-gate, notched to prevent breaking into the casting, leaves only a small amount of gate for grinding and the area is readily accessible to the grinder.

The sprue, gates, and castings in Fig. 11 are as cast, with no cleaning. The flat surface was flat within 0.003 in., requiring only 0.010 in. stock for finish.

Cut machining cost

The caster wheels in Fig. 12 are as cast except that the upper casting has had a small fin at the parting line removed with a file. The wheels are cast to finish dimensions with the exception of the bore, which must be machined to insure perfect contact with a pressed bearing sleeve. Stock removed from the bore is 0.015 in. Weight of the shell mold casting is 5½ lb; a machined green sand casting weighs 6 lb.

Pattern equipment for the casters consists of four aluminum patterns, two copes and two drags, mounted on a magnesium plate for booking. Aluminum sprues and gates are used. Stripper bolts are of the round-head type, mounted on a magnesium stripper plate. By elimination of machine operations, cost of the castings to the customer is less than the combined cost of the green sand castings and the machining operations.

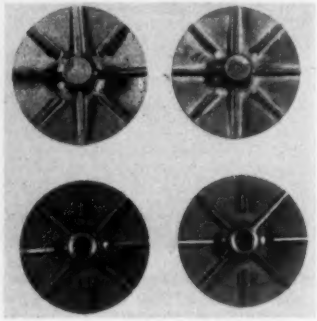


Fig. 13 . . . Sand cast impellers at left.

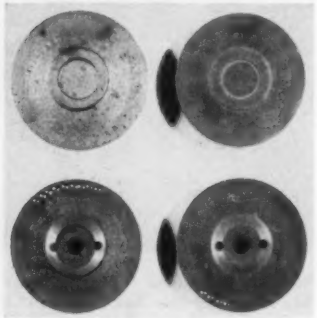


Fig. 14 . . . Backs drilled for balance.

Figures 13 and 14 compare shell mold and green sand castings. In each illustration, sand castings are on the left, shell mold castings on the right. The green sand casting has a considerably larger OD and is subject to swells, shifts, and roughness, and must be annealed for machining. As shown in Fig. 14, the green sand castings usually require a greater number of drillings in the perimeter for balancing.

Assures concentricity

The shell mold castings have a Brinell hardness of about 185 as cast, are extremely smooth and accurate with no shifting of cope and drag. Thus, concentricity of the boss with the perimeter is assured. Fewer holes are required for balancing. The OD was cast to $-0.000 + 0.010$ in.

The pattern used for this job consisted of four bronze pattern inserts, two copes, and two drags,

Fig. 15 . . . Malleable insulator cap made in green sand with shell cores.

mounted on a cast iron plate for booking. The castings were bottom-gated. Originally a ½-in. diameter sprue was used but this resulted in shot being formed when the iron was poured on the cold side. This difficulty was eliminated by substituting a tapered sprue.

Uses shell cores

Figure 15 shows two views of a malleable casting made in green sand with some of the shell cores shown in Fig. 17. The small hole was made by the projection on the smallest core while the inside of the casting was formed by the core at the top. Normally a complete shell which forms a balance core for a pair of castings, the core has been cut in half to show wall thickness. This core was produced by rotation of a split box contained a measured amount of mix.

The circular core at the lower left (Fig. 17) is part of a gas-burner core assembly and was produced by dump box, using a vibrator to insure smooth vertical surfaces. At the lower right is a part of the same burner assembly, but the core was blown. Effects of segregation of sand and resin in blowing—an unsolved difficulty in blowing dry resin mixtures—are shown clearly.

The standard pin core shown in Fig. 17 was produced in a split box. The gang core box was clamped much as it normally would be for blowing. A specially constructed hopper, which apportioned the mix for each cavity of the box, was brought in contact with the top of the box. As the material was released, a vibrator on the clamping plate was started. The hopper was removed and excess sand was vibrated out of the core, leaving a hollow core. Best temperature for this operation was found to be in the range of 400-425 F.

Hold close tolerances

The pin core with its split box shown in Fig. 16 is held to −0.000 + 0.002 in. on the diameter. The metal to be removed from the casting is 0.015 in ream stock.

Figure 18 illustrates a core made in a standard box rigged for shell core making. One half of the box has a bottom plate which seals the core box when it is assembled with the correct amount of sand (determined by experiment). The core is formed by rotation. The shell core weighs ½ lb compared to 5 lb when made in oil sand. It is easily removed from the casting, eliminates casting breakage, is true to the box because it doesn't sag, is easily handled and set, and imparts a better finish to the casting surface.

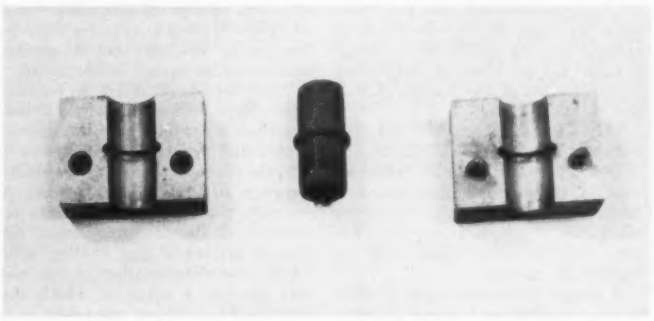


Fig. 16 . . . Shell pin core and box in which it is made within 0.002 in.

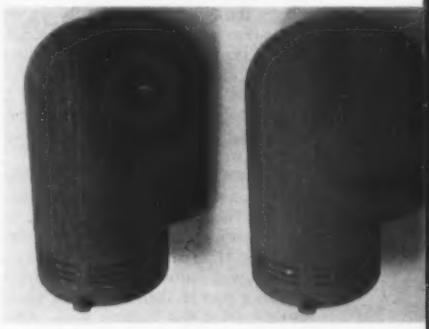


Fig. 18 . . . Additive affects finish.

Fig. 17 . . . Upper core in this assortment of shells has been cut to show uniformity of wall thickness. Core at lower right shows segregation from blowing.

Improved operation

How the core was improved is shown in Fig. 10. By making two cores in a single piece, production and core setting are speeded. The cores are strong enough to bake without driers.

Effect of a wetting agent on the flowability of a sand mix is shown in Fig. 18. The core at the left contains 0.6 per cent wetting agent, while that on the right has 0.1 per cent. Both contain 6 per cent resin. The core with the larger amount of wetting agent has more lines of fusion and is more porous.

How thermocouples in the stack control cupola melting

Cupola control by volume and pressure meters leaves much to be desired according to Mr. Taylor. He tells how to use pyrometers alone for control and reports results he has obtained in this article reprinted from the August 28 issue of *Foundry Trade Journal*.

R. I. TAYLOR / *Chf. Met., Suffolk Iron Foundry (1920) Ltd., Suffolk, England*

■ During the course of experimental work, it was found that temperature measurements taken a few feet down the stack of a cupola during operation seemed to vary according to the prevailing melting conditions. It was therefore decided to record these results continuously and to compare the information obtained with the actual physical conditions of the metal as tapped.

Surprisingly enough, it was noted that many variations in the furnace conditions had a direct bearing on pyrometer readings. In fact after making tests under close observation, it was found that the pyrometer reading was in direct relation to the condition of the melting zone. After a further study had been made of temperature readings in relation to metal conditions it was found possible to use the pyrometer completely to control the cupola.

Uses recording pyrometer

The equipment being used in the author's foundry is a continuous recording pyrometer (range 0 to 1,200 C) with the couple inserted through the wall of the cupola and protruding inside some 3 to 4 in. beyond the lining. The position of the couple is important; for instance, on a cupola of 30 in. ID and 16 ft to the charge hole, it should be located about 13 ft above the main tuyeres and at least 2 ft below the minimum height to which the charges are allowed to fall during normal operation (Fig. 1). The couple should be of the industrial type, protected in the manner usually adopted for immersion in molten metal.

The choice of the position of the thermocouple was reached after much exploratory work. In order to obtain consistent readings from a couple inserted at a position where the charges are to pass it continuously, it is necessary that the charges should at that point have reached some equilibrium with the flue-gas temperature. On the other hand, to insert the thermocouple at a point too low in the stack would present the problem of preventing actual fusion of the couple during the blowing down.

The suggested position gives a working temperature in the region of 500 C and a maximum temperature at blowing down of approximately 1,150 C, which is about the maximum at which a couple of this type may be used repetitively for significant periods.

A single pyrometer gives a satisfactory reading, but where a better installation is contemplated, it may be useful to obtain an average reading from several couples inserted round the cupola at the same level. In this case, the couples are connected in series and an extra series resistance is put in the meter circuit to compensate for the higher voltage output obtained.

Full and effective use of the installation depends upon an existing good cupola practice, and it is assumed that the charges in the stack are maintained at a certain minimum height, which must always be above the couple level, preferably 2 ft above, otherwise inconsistent results will be obtained.

With the equipment set-up as described, it has been stated that the instrument will yield temperatures bearing a direct relation to bed height and melting zone conditions. This follows from the fact that the bed temperature and height affect directly the temperature of ascending flue gases which are preheating the charges passing the couple.

If the flue-gas temperature decreases, the preheat available to the charges is also reduced and when these are melted they must absorb still more heat from a bed which is already at a lower temperature or height. In this way, the metal temperature progressively decreases although some considerable time elapses between a reduction in pyrometer reading and a similar reduction in metal temperature.

From the above, it will be evident that a deterioration in bed condition is shown immediately on the instruments and yet some time before a serious effect is noticed in the temperature of the metal as tapped. A corrective applied to the charge on receipt of the warning from the couple arrives at the melting zone before the deterioration of the bed has reached a stage at which the melt lacks sufficient superheat.

How to Calibrate

Having shown the nature of the readings obtained from the arrangement, it is now necessary to standardize and calibrate the temperature readings in terms of melting conditions in order to make full use of the information available.

For this, it is essential to obtain all the following information as accurately as possible. The cupola should be run for a three-day period (three "blows") and the following observations recorded:

1. After supervising the preparation of the bed, noting the bed height, and allowing a 30-min soaking period after completion of charging, make a note of the maximum temperature reached by the instrument within 20 min of the commencement of blowing the furnace.
2. Note the number of charges required on the bed to fill the cupola to thermocouple level.
3. At the end of the "blow," note the maximum temperature reached.
4. Record from time to time the

physical conditions of the metal as tapped.

These figures should show agreement between the three tests, and reference to the charts produced during the test-runs and to the notes made at the same time should enable a temperature figure for the couples to be assessed at which it may be expected that hot metal will be melted.

If this temperature agrees with the maximum temperature at the commencement of the blow it may be assumed that the bed is also at the correct height. On the other hand, should these temperatures differ widely and the metal is still cool after the third tap it is necessary to increase the initial bed height. A further run should be made to ascertain that the alteration made has been adequate. During this run the number of charges required to fill to the couple level must be recorded again.

Once the bed height has been satisfactorily established to give the conditions as recommended in the previous paragraph it is possible to estimate the weight of metal available during the blowing-down. During the test runs it will have been noted that the blowing-down temperature is exactly the same for each run and does not vary in any way when the operating conditions change.

Therefore, it is only necessary to produce a scale from zero, at the blowing-down, to the weight of metal obtained at charging-up to the couple-level in terms of degrees centigrade. The blowing-down follows a straight-line law, therefore all the divisions are equal; this simplifies the making of the scale. An original scale made during a blow-down is shown in Fig. 2.

To make corrections

In order to make corrections during the course of a melt it is necessary also to calibrate at least a part of the temperature-scale into coke weights, so that the "splits" may be correctly added or adjusted in weight; this follows from the fact that the temperatures indicated are in relation to bed heights.

Coke calibrations are made plus or minus from the "ideal" bed height, which is done by checking the volume of a normal charge excluding coke and limestone. A similar volume of coke is weighed, which is thus equivalent to a normal charge weight. On the temperature scale, calibrations have been made for blowing-down in terms of cwts., and it will not be found difficult to apply the coke equivalent figures to the temperature scale (Fig. 2).

Once the instrument has been calibrated as described and the "ideal" temperature estimated for the melting, it is possible to run the cupola entirely by the instrument. A little thought and experience enables any variation in the running of the cupola to be corrected before the metal is affected. The following notes show how this is done and how to recognize and correct the normal faults which are encountered.

When building the cupola bed, it is usual to use some measure such as an iron rod or a chain to which is attached a weight which can be lowered down the shaft until the correct bed height is reached. If this is not already a standard practice

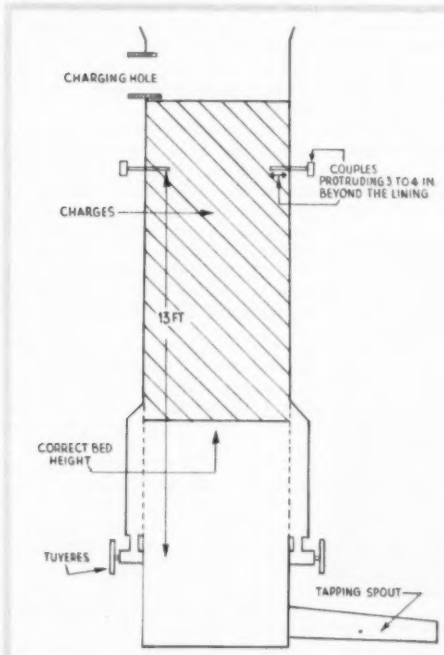


Fig. 1 . . . Diagrammatic view of cupola showing positioning of thermocouples in furnace lined to 30 in. ID.

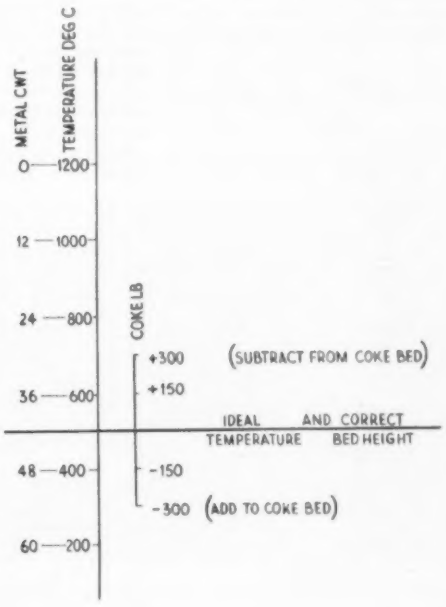


Fig. 2 . . . Chart developed for each cupola using pyrometer control indicates metal available and coke corrections.

in all foundries, it is strongly recommended that it should be adopted. Furthermore, the bed should be blown through until the coke is incandescent to within 6 in. or so of the top; this will allow the bed to settle and at this stage, measurements should be made.

In blowing the bed through, it is found that if the meter indicates a little above "ideal," the conditions given in the earlier paragraphs are satisfied. Charging should then take place and be completed some 30 min before commencing to blow the furnace. It should be noted that the correct bed height will already have been found as described above. Figure 3 shows a typical cycle covering lighting and preparation of the bed and continuing with the full-day's run.

When the blast is put on, the readings from the thermocouple will rise somewhat steeply and then level out, the rate of rise and maximum reached being an indication of the coke bed condition. Metal should be tapped directly the levelling out has taken place, in order to clear the cooler metal from the well. By this time, it will be known whether or not the bed height is correct and if not, a correction should be made as soon as possible. Reference to the calibration scales in terms of coke will enable a reading to be made of the amount of correction needed.

If the bed is low, the extra coke should be added as one large increment, but if it is high it is advisable to deduct the coke from the "splits" between the metal charges, so that full correction takes place over ½ to 1 hr. A small departure from the "ideal" may be tolerated and left uncorrected, but this is a matter for the operator to assess by experience.

Adjusting the coke charges

After the first 15 min of operation it may be noticed that the indicator is rising or falling, showing that the coke-ratio is too high or too low. The rate of rise or fall is the most useful information and, at the end of a 30-min period, a check will show how much coke has been gained or lost; this figure can be divided amongst the charges put on during the same period, giving the net gain or loss per charge. Adjustment of the charge-coke weight by this figure will bring conditions back to normal.

If a gradual change be allowed to take place over a long period, it will be appreciated that a correction must also be made for the gain or loss of coke during that period and the correction of the charge-coke weight is only to arrest the change. Figures 4 and 5 indicate the types of records obtained when the bed height is increasing and decreasing respectively.

When scaffolding takes place, an indication is given by a rapid rise followed by a rapid fall of the indicator, the time in which this takes place indicating the extent of the scaffolding. The bed is sometimes lost during these events and a correction may be necessary.

In studying the charts it will have been noticed that the line plotted is not smooth but is stepped and also shows regular rises and falls. Each step shown represents a tap of metal from the cupola and the rises and falls correspond to the arrival of new charges to the melting zone.

Some foundries tackling a variety of work find it necessary to work in special charges during a "blow," and the writer has found the instrument invaluable to show when the special charges start to melt. The charging procedure is somewhat unorthodox but works well in practice and is therefore recommended. To obtain good results, the bed should be at the "ideal" value as determined by the apparatus or slightly below this figure. Charging is then stopped until the burden descends to the level of the thermocouple. At this point, a treble charge-split of coke is added, followed by the special-metal charges, each of which has a little less coke split than necessary, in such a way that the large split is consumed in melting the special charges. Following the special charges, normal charging may be resumed.

As melting proceeds and the special charges reach the melting zone, the indicator will show a small rise due to the extra coke starting to ignite. On entering the melting zone, the ignited extra coke becomes incandescent and the extra heat available affects the indicator which will show a sudden rise of about one minute's duration. At this point, the

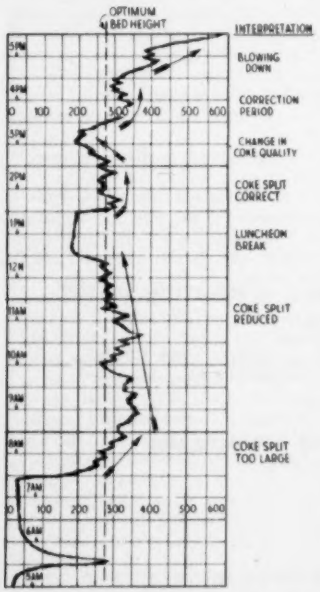


Fig. 3 . . . Record from cupola thermocouple showing a complete cycle.

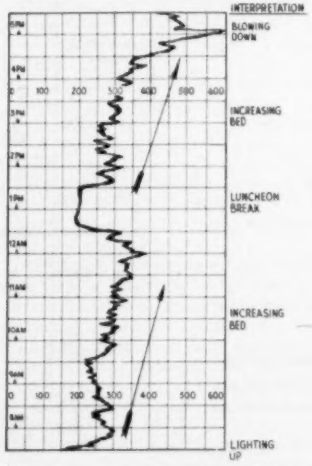


Fig. 4 . . . Melt record showing effect of increasing bed height during heat.

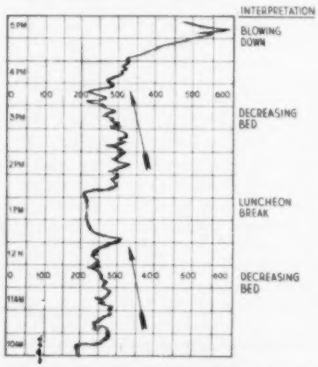


Fig. 5 . . . Temperature changes during heat with gradually decreasing bed.

special charges are beginning to melt.

In describing the use of the instrument for cupola control, it may be realized that the instrument also serves to check that the cupola staff is following out a lighting procedure at the set times. Such a record is in itself useful and does much to make certain that the cupola will start off under ideal conditions. A further asset is that the instrument enables the minimum coke to be used consistent with good metal temperatures and enables compensation to be made for cokes of varying calorific values.

Although the instrument used by the writer is of the recording type, this is not essential for minute-to-minute control and the normal indicating type of pyrometer may be used to provide quite good results. Frequent observation is, however, necessary in employing such an instrument. The melting rate in relation to the maximum output of the cupola has not been mentioned, since the indicator is not thereby affected, but it is necessary to follow normal cupola practice when melting at high outputs by running slightly above "ideal" to keep the bed height up to the higher melting zone encountered at such times.

It is hoped that the publication of this information will enable those metallurgists interested in cupola control to install equipment and derive as much benefit from its use as has the author in his own foundry. The writer wishes to express his appreciation to the directors of the Suffolk Iron Foundry (1920) Ltd. for permission to publish this work and especially to Mr. Danielli who has shown special interest and given encouragement in the author's endeavor to improve cupola practice.

▶ *Expand tour plans for 1953 International in Paris*

■ Four European tours are planned for western hemisphere foundrymen attending the 1953 International Foundry Congress in Paris, September 19-26. Originally intending to accommodate some 100 foundrymen and their wives, the American Foundrymen's Society, which is planning the arrangements, scheduled two tours of approximately five weeks. With over 325 registered for the trip, plans have been expanded to provide four trips leaving New York a week apart starting August 18. Tours will run 33 to 39 days exclusive of travel to and from Europe. All travel and accommodations will be arranged by the old, established international travel and tour agency Exprinter Travel Service, the American branch of the French organization Havas-Exprinter. Exprinter will operate the tours on an all-expense basis.

Steamships to be used on the tours are the Cunard liners *Mauretania*, *Caronia*, *Queen Mary*, and *Queen Elizabeth*, as well as the French liners *Ile de France* and *Liberte*.

While the tours are being set up for steamship travel, those desiring to fly in either direction can make such arrangements. Standard itineraries also can be altered in advance to meet the desire of any person. All-inclusive cost of the tours will range between $1800 and $1900 per person. Exact cost will not be known until trip details are established.

Each of the four tours includes a week at the International Foundry Congress. All events during the Congress—technical sessions, luncheons, banquets, sightseeing, plant visits, and a special ladies program—are being arranged by the Association Technique de Fonderie de France under the direction of M. Paul Muguet, president.

Members of the International Committee of Foundry Technical Associations are arranging for foundrymen of England, Belgium, Holland, Germany, Switzerland, and Italy to play host to their overseas friends by opening their plants for visitation.

International Vice-President L. N. Shannon, Stockham Valves & Fittings, Inc., Birmingham, Ala., a past president of A.F.S., will head the American delegation. Assuming the presidency of the International Committee in January 1953, he will preside at all meetings of the committee during the 1953 International.

The "official party" will include: Mrs. Shannon; A.F.S. President I. R. Wagner, Electric Steel Castings Co., Indianapolis, and Mrs. Wagner; A.F.S. Vice-President Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., and Mrs. Carter; and Immediate Past President Walter L. Seelbach, Superior Foundry, Inc., Cleveland, and Mrs. Seelbach. It is expected that each of the members of the National Castings Council will be officially represented, as they were at the 1952 International Foundry Congress in Atlantic City.

Commitments for the tours will be made as soon as itineraries and plans are completed. All interested are urged to register at once with A.F.S. Secretary-Treasurer Wm. W. Maloney, American Foundrymen's Society, 616 South Michigan Ave., Chicago 5, Ill.

▶ *Portevin receives Seaman medal*

Prof. Albert Portevin (left) received the A.F.S. Joseph S. Seaman gold medal he was unable to accept in person during the 1952 International Foundry Congress at a ceremony in the American embassy in Paris recently. Ambassador James Clement Dunn (center) made the presentation. Jefferies Wyman (right), science attaché, introduced Prof. Portevin, and enumerated his achievements. Over 100 attended the reception honoring the distinguished French metallurgist.

Ancient art of bell founding creates universal symbol of joy

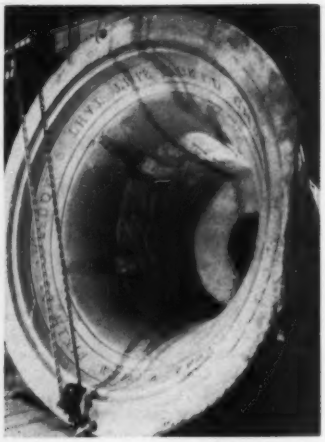
■ From joyous nativity celebrations to solemn tollings for the dead, the sound of bells has come to be a universal symbol of memorable occasions. It is significant, therefore, that bells are solely the product—and among the most ancient—of the foundryman's art.

Most of the world-famous bells have been cast in European foundries. The casting of the 10-ton Anglo-American "Freedom Bell," pictured here and on the cover, was the work of Gillett & Johnston, Ltd., of Croydon, England. Today "Croydon bells" ring from Amherst to Zanzibar. The Bourdon of the 72-bell Gillett & Johnston carillons at Riverside Drive Church, New York, weighs 18¼ tons—the largest bell ever cast in England. Even so, the 108-year-old company is a newcomer, comparatively, in the bell-founding business.

"The craft of bell founding is almost as old as civilized man," according to Dr. H. M. Howard, director of Gillett & Johnston. "The Chinese were casting bells as long ago as 4,000 B.C. In fact, some of their practices are still valid today," he asserts.

To illustrate, Dr. Howard points out that it is still common practice in European foundries to build up the core mold of bricks covered with sand having a high clay content and cows' hair as a binder. Shape of the mold is controlled by a strickle board or sweep pivoted on an upright spindle—some of the first real tools developed for metal casting.

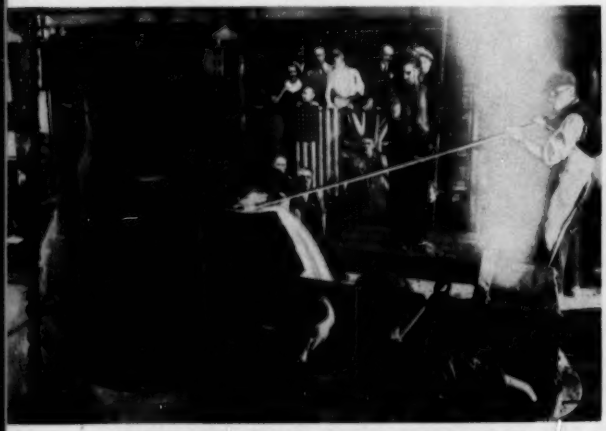
Cope of "Freedom Bell" is built up in successive layers with strickle board.



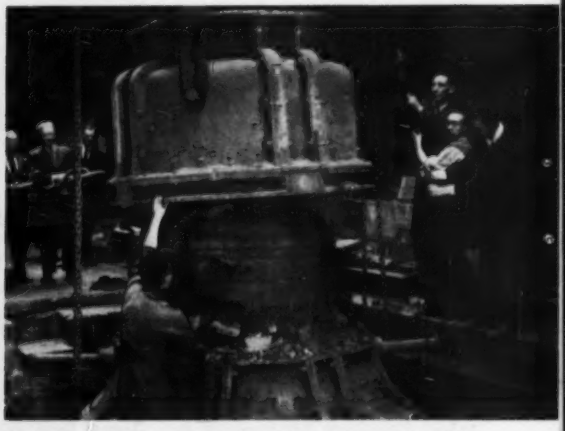
Decorative devices are stamped in reverse on graphite-coated surface of cope.

The lost-wax method is still used in affixing inscriptions or decorations. These are placed on the core over which the outer mold is built

continued on page 110



Heat is tapped from reverberatory furnaces at 1100 C. Metal is 13 parts copper to 4 of tin. Flags mark nature of casting.



Shakeout is done in pouring pit. Bells are then machined for tone. The 10-ton Anglo-American required a week for cooling.

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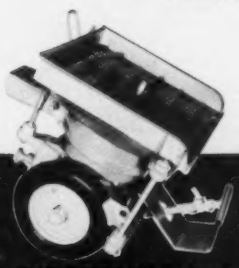

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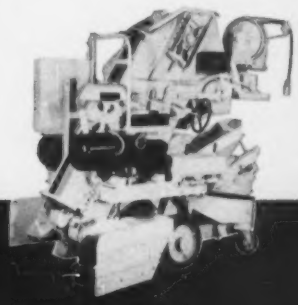

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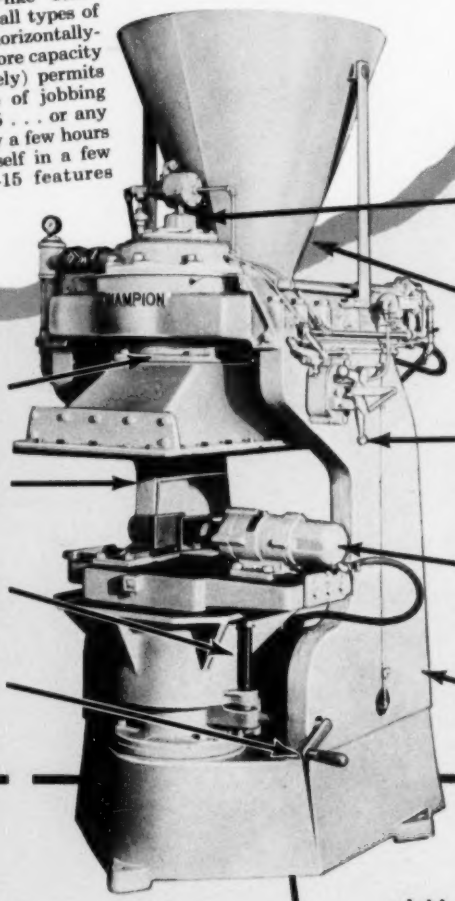

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Three ways to control foundry dust

Isolation . . . Substitution . . .Wetting Agents

H. G. MEITER / *Director, Ind. Hygiene Div., Employers Mutual Liability Insurance Co. of Wisconsin*

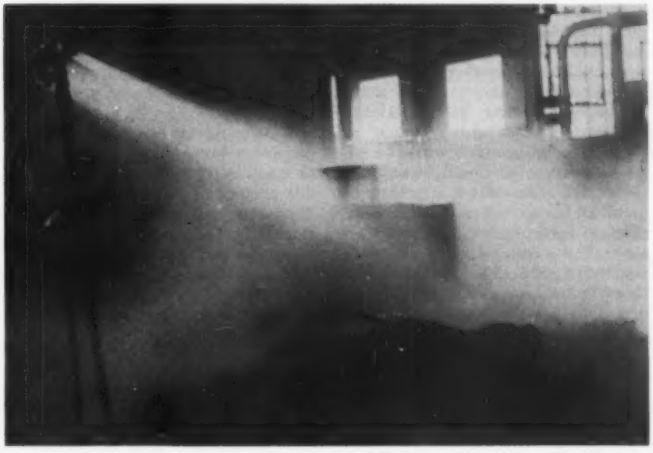
Three basic methods of dust control and their application in foundries are covered in this article taken from the recently issued A.F.S. publication *Health Protection in Foundry Practice*. The paper is one of 19 presented at a foundry health conference held at the University of Michigan.

■ The dust problem is recognized by the larger foundries, but may not be by the smaller ones. Lack of dust control in smaller plants is not necessarily due to lack of interest but because they have not been reached by industrial hygiene and safety engineers who can explain the important benefits to be derived from an adequate dust control program.

An effective program must be sold to top management, to the supervisory force, and to the workers themselves. This cannot be accomplished by bulletins or circulars, but requires personal calls by competent industrial hygiene or safety engineers.

It is not enough to tell an employer that the air in his foundry has so many million dust particles per cubic foot of a specified free silica content, because of which he should initiate a dust control program. He wants to know the practical significance of these figures. Are additional ventilating facilities necessary? Will the proposed changes slow down production or lead to inferior castings? What are his legal responsibilities in reference to occupational disease?

The importance of dust control may be brought to the attention of employees in two ways. The medical aspects and general precautionary measures may well be discussed with the employee by the examining physician during pre-employment and routine physical examinations. Additional information may be given by the industrial nurse during the employee's visits to the first aid room. The engineering aspects and reasons for protective measures should be given through the same channels as the job instructions.



Wet water mist from nozzles at side of shakeout allay dust in eastern foundry.

The failure of a well designed program may be due to lack of attention to job training. Supervision and enforcement are important.

Factors such as plant layout, type and size of castings produced, and existing ventilating facilities will vary greatly from plant to plant. All foundries, however, lend themselves to the application of the three basic methods of control—isolation, substitution, and wetting agents.

Isolate in space or time

Dust control by isolation is based on exposing only those employees required to conduct the dust producing operations. This minimum number is in most foundries only a small percentage of total employment.

For isolation in space, dust producing operations should be segregated in separate buildings or departments, or completely enclosed within a department. The grouping of such operations also aids materially in the effective application of local exhaust or other dust control measures.

In some instances, it may be more feasible to isolate the non-dusty operations. For example, core making is not dusty in itself and dust concentration in the core room is generally low where good housekeeping is maintained. Isolating the core room from other dust producing operations is therefore highly desirable.

Isolation in time is achieved by delaying dust producing operations to the night shift or to times when only minimum numbers of workers are exposed. This type has gained

wide favor in foundries through limiting the shakeout to the night shift when only a small crew, preferably protected by respirators, is in the foundry.

Sand conditioning should be done on the night shift where possible and the operators protected by respirators. Emptying dust collectors and major cleanup operations may also be isolated in this manner. Isolation as to space or time is particularly applicable to small foundries since it is the simplest and the least costly to install and operate.

Use less toxic materials

Since all dusts are not equally hazardous, the substitution of a nontoxic or less toxic material is well recognized for the engineering control of occupational disease. This method attacks the problem at its source, is effective and is usually inexpensive.

An important constituent of foundry dust from the health standpoint is the free silica which is present in molding sands, core sands, some parting compounds, and sandblast sand. The elimination of materials containing free silica, or the use of those with less silica is therefore desirable.

An example is the substitution of steel grit or shot in abrasive blasting. Studies made in the past by the U. S. Public Health Service and other agencies have shown that this substitution reduces both the dust concentration and the percentage of free silica in the dust to which the operator is exposed. However the use of non-siliceous abrasive alone does not entirely solve the dust problem. Control measures are still necessary.

In abrasive blasting where sand must be used, commercial equipment is available which if properly installed and operated provides adequate protection for the operator.

A further example of substitution is the use of parting compounds containing little or no free silica. Ground silica used in past years has given way to other compounds which are less or non-injurious to health. For additional control, the non-silica parting compounds should be applied without scattering of dust.

Wetting agents

The application of water is probably the oldest method of dust control. In the foundry it has been used principally for sprinkling floors, gangways, and aisles to prevent the dispersion of dust. However, water does not wet small particles readily, nor does it always rapidly penetrate a mold. Ordinary water is not "wet" enough for many industrial applications. To overcome this undesirable characteristic, chemists have developed materials which, when added to water even in minute quantities, will cause considerable reduction in surface tension. Such materials are known as wetting agents.

Wetting agents designed for specific purposes are now commercially available for reducing the surface tension of water and increasing the wetability of materials used in foundry operations. Wet water spreads rapidly and penetrates much like a penetrating oil which creeps into all surfaces and crevices. Dust difficult to wet can be wetted if the proper compound is used and correctly applied.

Wetting agents are shipped in concentrated form either as a liquid or as a solid (cartridge type) and usually require dilution before use. Automatic proportioning equipment is now available for dilution. The recommended dilution is 1 part of concentrate to 1,000 parts of water by volume. The solid cartridge is generally equivalent to 1 gallon of concentrate.

Wet water is usually applied by spraying through one or more nozzles at pressures varying from 75 to 125 psi. For best results select a spray pressure and type of nozzle to create the correct size and pattern of spray. Regardless of the efficiency of the wetting agent, good results will not be secured if the nozzles and spray are not at the proper locations.

Application of wet water

Wet water can be employed in three ways to control dust in the foundry: (1) As a means of preventing the dispersion of dust accumulated on floors; (2) To suppress dust at the point of origin; and (3) To remove dust from the air after it has escaped from its source.

As a means of preventing the dispersion of accumulated dust on floors, many foundries have been sprinkling floors, gangways, and aisles. Ordinary water wets only the surface of the floor sand, forming mud, or if applied too heavily it causes puddles that create a potential hazard with splashing metal.

Since little penetration takes place, air currents evaporate the moisture rapidly, allowing the floor to become dusty again soon. Wet water, however, will penetrate and disperse through the sand, clay, or other materials without forming mud or pools. Walking over the newly sprayed floors will not disturb the top surface, exposing the dry dust underneath, but will merely pack the surface.

In suppressing dust at its point of origin, wet water has been found useful in controlling dust arising from sand conditioning machines at the locations where the sand is dumped into hoppers by bucket or conveyor. Flat spray nozzles mounted above the hoppers provide a mist blanket which settles the dust.

A further application is to prevent the dry binders added to sand mullers from being exhausted to the dust collector. The method recommended is to install flat spray nozzles on the periphery of the muller casing and spray towards the center, forming a liquid blanket over the muller.

Wet water for shakeout

To remove dust from the air after it has escaped from its source, wet water has been used to control dust at shakeout operations, either ventilated or unventilated. Where ventilation is already applied, wet water supplements it. Where no ventilation is applied, one method employs a cluster of solid cone atomizing nozzles mounted on vertical and horizontal piping extending over the top of the shake-out. If this construction interferes with crane operation, a swivel pipe fitting can be installed which allows the nozzle piping to swing back against the wall or post.

Some foundries use cranes to remove large castings from the flask. The flask is swung by the crane and bounced against another casting, usually located in the center of the shake-out floor. Such dusty operations are hard to control, due to the various sizes of castings and the area covered. Wet water can be used to control the dust at such operations by installing spray nozzles on the crane bridge and mounting the water tank on the crane itself.

▶ *Make shell molding film*

Shell molding at Cooper Alloy Foundry Co., Hillside, N. J., is shown in a short motion picture available for general use. The film was originally made under the auspices of the National Association of Manufacturing for showing over a nationwide television network.

In the news ★

Technical program to dominate 1953 CONVENTION

■ Convention paper receipts were heavy the first half of December as authors rushed to meet the 15th of the month deadline. With the 1953 A.F.S. Convention expanded from four to five days, the enlarged technical program will dominate next year's non-exhibit meeting. To be held in Chicago May 4 through 8, the 1953 Annual Meeting of the Society, will include technical sessions on every phase of foundry practice as well as the usual features of special interest to operating men—the round table luncheons and shop courses.

48 technical sessions

Technical sessions scheduled to date number 48. Of these, 32 are the usual technical meeting with two or more papers and committee reports. Two of the sessions, scheduled for Wednesday, May 6, have been set aside for a Symposium on Sand Reclamation. The symposium papers will cover all types of foundry sand reclamation equipment currently in operation on which service data are available.

Six of the sessions will consist of the informal round table luncheon meetings customarily held by the five metals divisions and the Pattern Division. Discussion topics announced to date are: gray iron—*"Scrap Reduction;"* pattern—*"Questions and Answers;"* light metals—either *"Shell Molding"* or *"Surface Finishes;"* brass and bronze—will repeat popular discussion of prepared questions; and steel—*"Hot Tears."*

Two shop courses of three sessions each (evenings of May 4, 5, and 7) and a third scheduled for May 4 and 5 round out the total of 48. Topics to be covered in Gray Iron Shop Course are: *"Gating, Risering, and Pouring and their Relation to Scrap," "Chill Control,"* and *"Carbon Control in the Cupola."* Sand Shop Course topics are *"Pinholes in Castings," "Evaluation of Molding Processes,"* and *"Mulling Techniques in Their Relation to Casting Quality."*

Gray iron papers expected to be presented include discussions of cupola operation, heat treatment, casting reclamation, machinability, and fundamentals of solidification.

In the light metals field, several papers on shell molding are planned as well as several devoted to properties and casting of titanium. Papers on aluminum and magnesium will cover permanent molding, turbulence defects in permanent mold castings, rare-earth alloys, casting of magnesium in shell molds, statistical quality control, gating principles applied to aluminum, die casting, and relationship of mold hardness to properties of aluminum alloy castings.

The Time Study and Methods Committee has scheduled a long paper on indirect labor incentives combining the work of committee members in three plants. Also planned are papers on *"Core Finishing Standards"* and *"Conveyor Molding Standards."*

Planned by the Sand Division, in addition to the all-day symposium on reclamation are papers on shell molding and on prevention of sand segregation in storage, and committee reports on veining tests, flowability, deformation, mold surface reactions, standard test patterns, and sand grain distribution.

Educational Division plans call for two sessions. At one, the first paper will outline the shortcomings in education of men for the foundry industry, while the second paper will contain suggested remedies. The other session will feature representatives of companies which have outstanding training programs.

Among Brass and Bronze Division papers are discussions of melting losses, effect of mold material on 85-5-5-5, perlite and its application, effect of defects on certain physical properties of bronzes, and fracture tests.

Pattern Division papers will cover patterns for shell molding and evaluation of pattern castings.

Heading the list of social events is the Annual Banquet to be held the evening of Wednesday, May 6, President I. R. Wagner, Electric Steel Castings Co., Indianapolis, will preside and Gold Medals and Honorary Life Memberships will be presented. Other traditional events will be concentrated in the middle of Convention Week.

The Annual Business Meeting with the Presidential Address, election of officers and directors, and presentation of awards to first place winners in the A.F.S. Apprentice Contest heads the schedule of events for the morning of Thursday, May 7. Immediately following is the Charles Edgar Hoyt Annual Lecture which will be delivered by James H. Smith, general manager, Central Foundry Div., General Motors Corp., Saginaw, Mich.

Apprentice contest

The Annual A.F.S. Apprentice Contest, now in its 30th year, will close the middle of March 1953 with national judging taking place in Chicago on or about April 1. The competition is open in five divisions —metal patternmaking, wood patternmaking, and gray iron, non-ferrous, and steel molding. All apprentices in North America are eligible if they are taking a regular training course of not less than three years duration and are not over 24 years old on the day they prepare their entry. For veterans, the age limit is 24 plus the length of their term of service in the armed forces, according to Apprentice Contest Chairman Roy W. Schroeder, University of Illinois, Chicago.

For details on the competition which pays $100, $50, and $25 in prizes in each division and round trip rail and Pullman fare between their homes and Chicago for the five first prize winners, write Jos. E. Foster, A.F.S. Headquarters, 616 S. Michigan Ave., Chicago 5, Ill.

Employee attitude on safety controls accident rate

Worker attitudes reflect attitudes of supervision and both strongly influence the success of a plant safety program. This story, based on a paper presented at the 1952 National Safety Congress, tells how one plant reduced accidents and workman's compensation premiums by promoting employee cooperation and good housekeeping.

J. P. MC CLENDON / *Supervisor of Services, Stockham Valves & Fittings, Inc., Birmingham, Ala.*

■ What about the safety problems of the worker in the latest, up-to-date plant? Is his situation any better than it was in the old plant. Is he happy, looking ahead with confidence to the guidance and direction of management, or is he still in the industrial horse and buggy age?

Even in the finest plant, very little can be accomplished without the cooperation of the workers. When good cooperation exists, cost of accident prevention never limits the correction of safety hazards. Cooperation in safety can be developed and it is as essential to a modern plant as good equipment and careful plant layout.

The attitudes of the workers usually reflect the attitudes of the supervisors. It is important, therefore, to keep open the channels of communication, to pass the ammunition—in this case, information and instruction on safety. Safety is a state of mind.

The Stockham safety program has the full backing of management, from the president down to the lowest classification of supervisor. The safety director coordinates safety programs planned by the department superintendents and foremen. When an accident occurs the safety director makes an investigation with the supervisor of the department in which it took place, and makes a detailed report that gives all the facts and makes recommendations aimed at preventing recurrences.

Foremen are directly responsible for the safety of their employees and the safety conditions of their departments. Their duty is to have all known hazards corrected immediately.

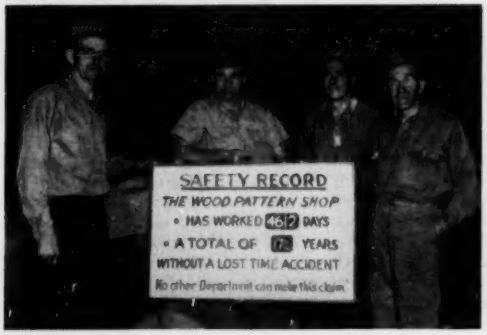
In 1941 Stockham had a perfect safety record with no lost-time accidents. Unfortunately, a fatality at the close of 1940 was the motivation that carried the plant to the safety record in 1941. When a carpenter fell from an improperly rigged scaffold and died from his injuries every worker became safety-conscious. Regular safety meetings were held. Near-lost-time accidents were played up. Day in and day out during 1941 the record climbed: 100 days — 200 — 250 — and finally 365 days without a lost-time accident.

Cleanup contests play a big part in the safety program. A clean shop is a safer shop and "Cleanup for Safety" contests between departments are very popular in the plant. The contests are directed and publicized by the safety director. Top supervisors and other executives are the judges. The foremen and workers of winning departments share in the awards.

One result of the last cleanup contest was a lowering of the accident-frequency rate which, in turn, earned a 10-per-cent reduction in workman's compensation premium. Management, of course, promptly informed the department foremen of the premium reduction and gave them full credit for making it possible. The foremen congratulated their personnel on their individual and departmental safety records. Foremen and workers alike take great pride in the signs showing the total number of days worked since the previous lost-time accident.

Shop safety meetings are planned and conducted largely by the workers. Supervision provides the time,

continued on page 104


SAFETY RECORD
THE WOOD PATTERN SHOP
• HAS WORKED 461? DAYS
• A TOTAL OF 7? YEARS
WITHOUT A LOST TIME ACCIDENT
No other Department can make this claim

Plaque attesting enviable safety record is displayed by Supervisor J. C. McClendon and three of his co-workers.

Weekly fittings of safety glasses by local oculist is part of safety program at Stockham Valves and Fittings.

Develop training course on foundry safety fundamentals

Trial run on a foundry safety course developed as part of the Safety & Hygiene & Air Pollution Program took place November 6 and 7 when Chicago-area foundrymen met for an intensive training program on safety fundamentals. The course has been developed for use by plants or foundry groups—complete instruction kits and instructors are furnished by the American Foundrymen's Society.

■ Best approach to accident prevention in foundries is through foremen and supervisors, according to the A.F.S. Safety Committee, which has devised a short course in safety training for wide-spread industry use. Supervisory representatives of 14 Chicagoland foundries attended the first course November 6 and 7 at the Sherman Hotel, Chicago, to learn how to pass safe practices on to their co-workers.

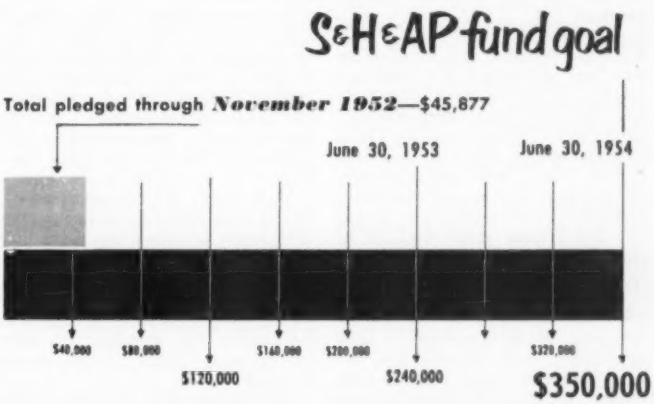
Practicality praised

"First time I've attended a safety meeting where safety was discussed in foundry terms" was the comment of one enthusiastic supervisor from a medium-sized foundry. All types and sizes of foundries were represented at this first course. Some companies with good safety records sent representatives because they wanted to keep their records good through application of latest methods of practicing and teaching safety. Some participants were from foundries that had no organized safety programs, according to Wm. N. Davis, director of safety, hygiene, and air pollution for A.F.S.

Developed so it can be presented at a two-day session, or in 10 two-hour meetings, the course is now available to any group of foundrymen interested in intensifying their accident prevention program. The group provides only the meeting place and the participants—A.F.S. provides the instructors and a complete kit of literature and texts. Cost is only $20.00 for members of A.F.S. and companies participating in the Safety & Hygiene & Air Pollution Program; cost to others is $35.00.

The kit contains all literature developed by the Safety & Hygiene & Air Pollution Committees, safety manuals published by the U. S. Dept. of Labor, and safety literature developed by the National Safety Council, various foundries and suppliers, and insurance companies.

Broad scope of the course is evident from the subjects covered. They included: how to organize a safety program, importance of the foreman in safety, building safety into the plant and the working force, maintaining interest in safety, accident records and analysis, demonstrations of personal protective equipment and of electrical hazards, machine guarding, materials handling, industrial health hazards, fire prevention, and plant inspections.



Contributors during November were: Albion Malleable Iron Co., Lynchburg Foundry Co., Alamo Iron Works, Bay City Foundry Co., and Bonney-Floyd Co.

Raymond Bonneau, Inland Steel Co., demonstrates fire hazard created when line is overloaded by "slugging" a fuse instead of replacing it after eliminating short.

Costs and quality can be controlled by

Application of a wage-incentive plan

C. J. PRUET / *Chf. Ind. Eng., McWane Cast Iron Pipe Co., Birmingham, Ala.*

Symbol of modern production management is cost control. Accurate labor measurement, standardization of procedures, and knowledge of plant capacity, obtained by thorough methods and time-study analyses, are the bases upon which a realistic and sound system of cost and production control are built.

■ In the modern industrial plant high production and low costs are achieved by various production controls and techniques which management and supervision exercise. These controls and techniques are concerned directly with the utilization of manpower, material, machines, and facilities. Incentive pay is the oil that makes these controls of management work smoothly and with real effectiveness.

A wage-incentive plan is a powerful management tool for cost control. Like any fine tool, it must be used intelligently and with skill and mature judgment. Only persons with proper training, background, and experience should attempt to install a wage-incentive system. When management decides to apply a wage-incentive plan, a competent engineer must be put in charge of the program or the plan will not be fully successful and may result in utter disaster.

A wage-incentive plan is not a substitute for good supervision or management. It is only a tool or a means by which supervision can more effectively control production and costs. More benefits may be obtained from the production and quality-control features of the plan than from the incentive features.

Many years ago the primary objective of incentive plans was to give employees an opportunity to increase their earnings by increasing their production. Modern production management, however, insists upon an incentive plan that not only will accomplish this aim but will give management control over all phases of the business.

Advantages of a properly maintained and operated incentive plan designed for cost and production control are:

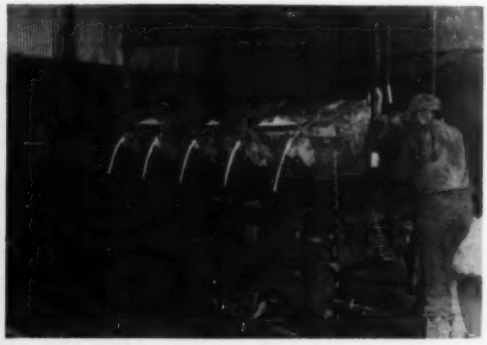
1. Increased production per manhour and improved quality of product. Under the incentive urge an operator develops superior skill, and a more skillful operator can produce work of better quality. Only work of acceptable quality is paid for under such a plan.

2. Better utilization of materials. On the principle of payment for results, extra pay is due for extra yield.

3. Decreased down time, delays, and rework. Supervisors and other indirect workers can earn extra pay by their effectiveness in using manpower, equipment, and materials, and in preventing delays, breakdowns, rework, and excessive scrap and handling.

4. Better supervision, because supervisors will have an extra incentive in developing the skills of those whom they supervise. They will be freed from the fear that they

Core setters at McWane Cast Iron Pipe Co. aligning green sand cores to close tolerances in green sand drag molds. This and other operations shown are under a wage incentive system.



Multi-lip ladle enables two operators to pour two pipe cavities at a time rapidly. Car holds two molds, each containing four pipes. Castings are 9 ft long, 2 or 2¼ in. diameter.

may be replaced by the men they have trained. They must be given enough authority, responsibility, and freedom of action to operate their departments effectively.

5. A more stable and satisfied work force resulting from fair base rates, incentives, and consequent earnings. Operators have the opportunity to earn extra pay and to compare their work records with those of others.

6. Less material in process, better utilization of manpower and equipment, better planning, and fewer delays, with consequently quicker delivery of finished goods to the customer.

7. Fewer accidents and less absenteeism, since lost time strikes a hard blow at incentive pay.

8. Bases for predetermining costs of new but similar products. These are especially important in jobbing foundries. The ability to get reasonable accuracy in estimating new jobs profits a company as much as the savings made by applying sound standards in the foundry.

9. A standard for judging the need for making changes in equipment. The variation in the job standard multiplied by the number of pieces to be made will reveal how much can be spent for new pattern equipment.

10. Ease of scheduling operations, since man-hours and machine-hours can be closely estimated.

Measuring performance

11. Unbiased measurement of employee ability. Any other method of establishing work loads permits showing favoritism, and weakens the yardstick for measuring both operator and supervisory performance. With this knowledge, supervisors can ascertain the amount of work to be done and the amount of labor and equipment needed to accomplish it in a given period of time. This is the basis of production control.

The ultimate results of an incentive plan based on sound principles are a lower total unit cost, higher pay for both the working and the supervisory force, a better product at a lower price, and a larger profit, all of which make for a better place to work and a better community.

When a wage-incentive plan is applied for the first time, management and supervision usually must change their thinking. New policies must be formulated; a new philosophy and new concepts must be learned. For a sound wage-incentive system is based on the principle of *payment for results*. This principle requires the control of quality, quantity, man-hours, labor costs, equipment, and materials.

To accomplish these aims the proper incentive plan must be developed to meet the requirements and conditions peculiar to the activities it is to accommodate. It must

Assembling dry sand cores for 4-in., 90 degree all-bell bend. Cores are baked dielectrically, assembled, pasted.

be flexible and intimately related to other management controls.

Procedures and equipment must be standardized as much as possible within practical limits—the method of doing the work, the tools, fixtures, workroom layout, equipment, and standards of quality and finish.

A fair base rate for the job then should be established by job evaluation and guaranteed to the operator for each hour he works regardless of how much he produces. Such rates, of course, must be in line with the base rates for similar work in the industry or the community.

Standard-time values should be established by motion-and-time study. Established standards must consistently reflect the amount of work required so that earning inequities from job to job will not prevail. Standards must be based on definite quality requirements with proper and direct controls placed over waste.

The goal must be reasonably high, but possible extra pay for extra performance must be high enough to give an operator a real incentive to produce products of good quality in quantity. No ceiling should be placed on possible earnings. The only limit should be the ability of the operator.

Operators must not be penalized for lost time over which they have no control. Management should make every effort to avoid down time caused by lack of materials, poor scheduling, and breakdowns of machinery or other equipment. The operator should be paid the base rate for such down time to protect his premiums already earned.

On the other hand, supervisors should be penalized for excessive scrap, lost time, and overtime increment. By this provision management will gain control of three very costly items. It may be well also to add good housekeeping and safety to other supervisory duties.

Revising the plan

When the conditions on which the rates were set have changed, the plan must be revised, too, to adjust the rates to the new conditions. If this is not done the entire plan will collapse due to earning inequities resulting from changed methods. The incentive rate must be voided and the new work done at the base rate until a new standard is set. The payment of incentive earnings for non-incentive work is bad because it defeats the objective of the incentive plan—payment in proportion to production effort. To give operators credit for substandard work will weaken the incentive plan. The principle of pay for results must be maintained.

If an operator works out a better method of doing the job and thus shortens the time required, he should be given an outright monetary reward based on the savings resulting, and the standard should be changed.

Standards must be revised downward when work is removed from the cycle, permitting the operator to produce more items per hour with the same or less effort. Likewise, when work is added to the operation, the standards will be increased to compensate the operator for the extra work required.

Handling small changes

The problem of coping with small changes which accumulate over a period are the most difficult to solve. But if such changes are ignored, incentive earnings will not reflect performance. One practical way to handle small accumulated changes is to change the incentive standard when the changes reach some predetermined percentage point. It is better in the long run, however, to change the rate at the time of the method change, regardless of the amount of the change.

No heat treat needed for these

Strong aluminum casting alloys

DONALD L. COLWELL / *Div. of Laboratories, Apex Smelting Co., Chicago*

High strength in aluminum castings can be developed in certain alloys without heat treatment, saving production time and cost, and avoiding distortion which sometimes results during heating or quenching. The author shows typical castings and tells how intermetallic compounds formed in the alloys promote the high strengths. The paper was presented at the 1952 Ohio Regional Foundry Conference.

■ In selecting an aluminum alloy for a given casting, many engineers feel that it is necessary to use a heat-treating process to secure maximum strength. A glance at the mechanical properties of the popular silicon and silicon-copper alloys discloses the reason for this feeling. In the ASTM specification for sand castings[1] (Table 1) there are ten tensile requirements of 30,000 psi or more ultimate strength and 2 per cent or more elongation. Five of these are heat-treated to secure these properties, namely, C4A, G10A, SC51A, SC64B, and SG70A.

In the ASTM specification for permanent-mold castings[2] (Table 2) there are only eight tensile requirements of 30,000 psi or more ultimate strength and 2 per cent or more elongation, and five of these are heat-treated to secure these properties. These five are CS42A (three different treatments), SC64B and SG70A.

The other five strong alloys in the sand-casting specification and the other three in the permanent-mold-casting specification whose minimum tensile requirements exceed 30,000 psi and 2 per cent elongation, are in a class by themselves. Four of the five strong sand-casting alloys are covered by Military Specification MIL-A-12033 (ORD)[10]. High strengths of the alloys in this class are secured without heat-treatment.

These strong aluminum-casting alloys are characterized by the fact that they develop mechanical properties superior to the usual heat-treated aluminum, especially in the case of ductility and elongation. Their outstanding corrosion resistance will be mentioned later.

Three additional properties in which these alloys excel must also be mentioned. The first is their excellent machinability, for they are free-cutting and high machining speeds can be used. In one instance, for example, ZG32A has been turned at a surface speed of 2500 ft per min on a cut of about 1/16 in. At times the surface speed has reached 4000 ft per min and the cut 1/8 in., although these are not production conditions. No lubricant is used on this job.

This remarkable machinability also permits polishing and buffing which produces a high luster on a smooth white surface with much less effort than with the copper-silicon type of aluminum alloy.

The second characteristic is the dimensional stability of this type of alloy. Any heat-treatment and

TABLE 1 ... TENSILE REQUIREMENTS OF ALL ASTM SAND-CASTING ALLOYS OF 30,000 psi ULTIMATE STRENGTH AND 2.0 PER CENT ELONGATION OR BETTER

Alloy	Condition	Tensile Str. min., psi	Elongation in 2 in., min., %
C4A	T6	32,000	3.0
G10A	T4	42,000	12.0
SC51A	T6	32,000	2.0
SC64B	T6	32,000	2.5
SG70A	T6	30,000	3.0
ZC81A	Aged 21 days	30,000	3.0
ZG32A	Aged 21 days	30,000	5.0
ZG42A	Aged 21 days	33,000	2.0
ZG61A	Aged 21 days	32,000	3.0
ZG61B	Aged 21 days	32,000	2.0

TABLE 2 ... TENSILE REQUIREMENTS OF ALL ASTM PERMANENT-MOLD CASTING ALLOYS OF 30,000 psi ULTIMATE STRENGTH AND 2.0 PER CENT ELONGATION OR BETTER

Alloy	Condition	Tensile Str. min., psi	Elongation in 2 in., min., %
CS42A	T4	33,000	4.5
CS42A	T6	35,000	2.0
CS42A	T7	33,000	3.0
SC64B	T61	40,000	2.0
SG70A	T6	33,000	3.0
ZC81B	Aged 21 days	32,000	4.0
ZG32A	Aged 21 days	37,000	10.0
ZG42A	Aged 21 days	42,000	4.0

quench, particularly the solution heat-treatment, introduces a danger of serious distortion. These strong alloys require no heat-treatment, so this danger is absent. Furthermore, there is practically no tendency to natural growth.

Any tendency toward natural growth in aluminum alloys can be accelerated by aging at elevated temperatures. A comparison of the dimensional change of ZG32A and ZG42A and three common copper-silicon alloys, when aged at 350 F, is given in Fig. 1. The three common alloys exhibit considerable growth, while ZG32A and ZG42A have only a very slight shrinkage. This makes for much better dimensional stability in castings where accuracy of dimension is important.

The third particular characteristic is the ability of these alloys to be brazed. The solidus temperature of the copper-silicon type is usually about 965 F, but the solidus temperature of the zinc-magnesium type is much higher, 1030 F, and there is very little incipient fusion below 1100 F. This means that castings of these high-strength alloys can withstand brazing temperatures 100 F or more above those possible with the copper-silicon type of alloy.

Use any mold

ZG32A and ZG42A are well adapted to the sand, plaster, and permanent-mold processes and can be die cast. In general the technique used is the same as for other aluminum alloys except that a pouring temperature about 50 F higher is recommended, and the volume of metal used in the risers should be increased. In order to develop the maximum mechanical properties, it is essential that extra precaution be taken to prevent contamination. It is not necessary to apply chlorine or other expensive treatment to develop the high properties.

The castability of ZG32A and ZG42A is best evidenced by photographs of specific castings which are regularly produced by several foundries.

Figure 2 pictures one of a series of medium-velocity gasoline pump valves cast in sand. These castings must be pressure tight. They are of light weight, anti-sparking, and very easily machined.

Figure 3 shows a high-pressure oxygen valve body of ZG42A from which one quadrant has been machined. This casting is made in a permanent mold, and the extensive

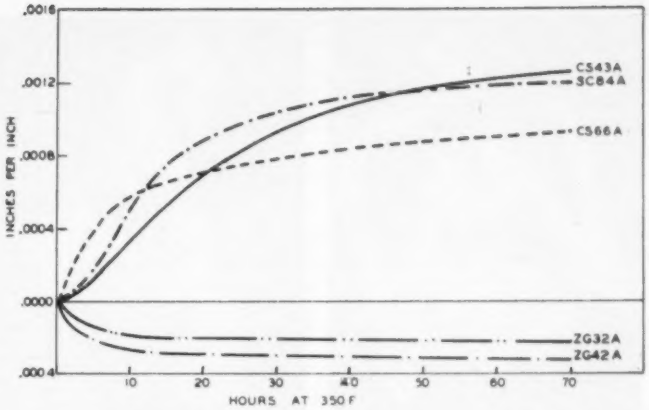


Fig. 1 . . . Upper curves show growth, lower curves shrinkage of chill cast, high strength aluminum alloys. Only heat treatment was the heating at 350 F.

Fig. 2 . . . Sand-cast gasoline pump valve body is light, easily machined, pressure tight, does not spark.

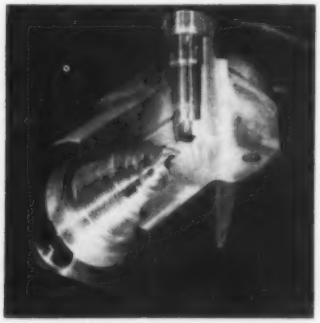


Fig. 3 . . . High pressure oxygen valve body made in permanent mold is cut away to show internal soundness.

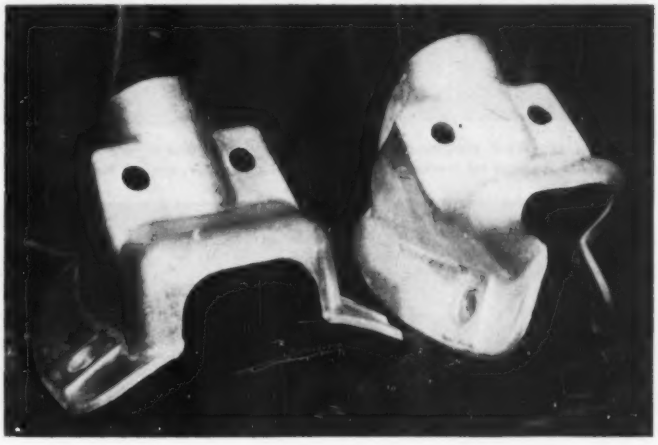


Fig. 4 . . . Permanent mold castings for street lighting fixture, as cast at left, deformed at right to show toughness. See Fig. 5 for gating and risering.

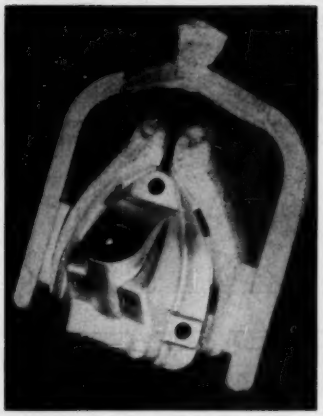


Fig. 5 . . . Street lighting fixture with gates attached. Core has 4-degree taper and 3⅓ in. draw.

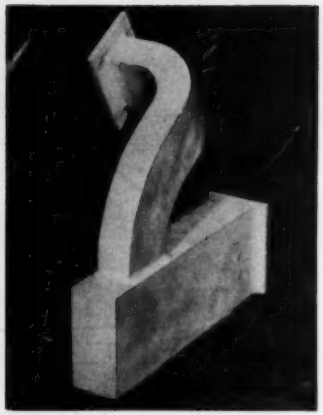


Fig. 6 . . . Three plaster-cast component assembled by brazing simplify production of complex shape.

counterboring, drilling and tapping operations required in a high-pressure casting are evident. There are more than 20,000 of these units in operation today.

A permanent mold-cast street-lighting pole plate casting is pictured in Fig. 4 and 5. This casting is set at the top of a street-lighting pole to hold the elliptical arm from which the light is suspended. The leverage applied by the heavy light is tremendous. Several aluminum alloys had failed on this job before the high-strength ZG32A was used. On the left of Fig. 4 is the casting itself; on the right is a casting which has been deformed in a vise to illustrate its toughness.

A casting with attached permanent mold gate is shown in Fig. 5. The sections are thin and are spread over a varying contour with three complete holes cast in place. The internal core has a 4-degree taper and a draw of 3-1/3 in.

Fig. 7 . . . Light weight aluminum clamps are favored by workmen.

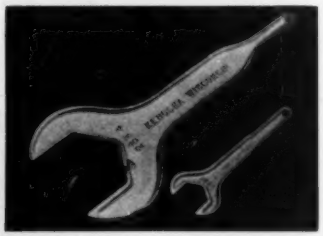


Fig. 8 . . . Handles of spanner wrenches are shaped for use of booster pipes.

Fig. 9 . . . Three sand-cast parts plus replaceable steel jaws make up this light 18-in. pipe wrench.

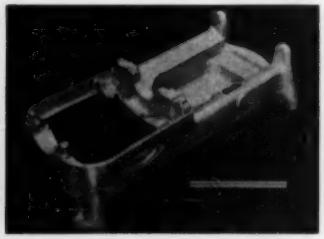


Fig. 10 . . . Base for pipe-threading machine is complex sand casting, weighs 60 lb, has pressure-tight oil sump.

Figure 6 shows three castings of ZG42A produced by the plaster process and brazed together. This is one of the many component assemblies produced in this fashion.

Pictured in Fig. 7 are two of a complete range of clamps which are manufactured in sizes from 1 in. to 12 in. With light weight and strength equal to heavier materials they have found great favor in the machine-tool and woodworking industry.

Sand cast easily

The open end or spanner-type wrenches of Fig. 8 are especially adaptable to setting or adjusting nuts on heavy machinery, such as dairy, bottling and paper-working equipment, where very fine rotation is mandatory. The handles are so shaped that booster pipes may be applied if necessary, without fear of breakage. Note here, also, the fine lettering detail on wrench handle. They are sand cast of ZG32A because of the toughness offered by good yield strength and elongation.

The wrench in Fig. 9 is a standard 18 in. Stillson assembled from three sand-cast ZG32A components. The external threads on the L-shaped jaw, as well as the internal threads on the adjusting nut are used as-cast. Forged-steel jaws are held in place with tapered dowels, and are easily removed for replacement. The internal contour of the sleeve section is formed with a dry sand core. These pipe wrenches are made in sizes from 6 in. to 24 in. and are very popular for overhead or off the floor work.

The base for floor or bench-model pipe-threading machine (Fig. 10) is sand-cast in ZG42A and weighs approximately 60 lb. The oil sump area must be pressure tight and the casting has many changes in section thickness. This rugged design permits portability without sacrifice of quality of the machine. Pipe legs are

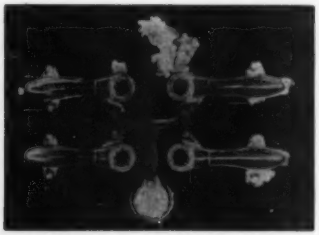


Fig. 11 . . . Cluster of die-cast handles for regulating valve. Castings will be anodized; alloy takes treatment well.

inserted in the four corner bosses for floor use.

Because of its white color and lustrous finish when polished, ZG32A was used in die-casting the handles for a regulating valve (Fig. 11). This is one of the few die-casting alloys which take the anodizing treatment well.

The nominal compositions of the high-strength alloys are listed in Table III. One of these, ZC60A, is included in the ASTM permanent-mold specification, but because it does not have the minimum strength indicated above it will not be discussed here, and only the remaining five compositions will be indicated when high-strength alloys are referred to below. The explanations following are simplified by considering only the principal alloying elements, but they will serve to illustrate the reasons for the exceptional performances of these alloys.

TABLE 3 . . . NOMINAL COMPOSITION OF STRONG-ALUMINUM CASTING ALLOYS

Alloy	Cu	Si	Mn	Mg	Zn	Cr	Ti
ZC60A	0.5	0.3*	0.05*	0.35	6.5	...	0.2*
AC81A&B	0.7	0.3*	0.6*	0.35	7.5	0.3*	0.2*
ZG32A	0.2*	0.2*	0.5	1.6	3.0	0.3	0.2*
ZG42A	0.2*	0.2*	0.5	2.1	4.25	0.3	0.2*
ZG61A	0.3*	0.25*	0.3*	0.57	5.6	0.5	0.22
ZG61B	0.5	0.15*	0.05*	0.7	6.5	...	0.2*

*Maximum. Unstarred values show amounts required by specification.

All zinc-magnesium

The five high-strength alloys are all of the zinc-magnesium type, but calculating from nominal amounts of alloying elements, three of them, ZC81A and B and ZG61A and B have gross ratios of zinc-to-magnesium of 10 or 20:1, whereas the other two, ZG32A and ZG42A, have zinc-magnesium ratios of about 2:1. The difference is fundamental, and becomes even more apparent when allowance is made for the low amounts of silicon which may be present. The silicon has a tendency to combine with the magnesium to form Mg_2Si, thus depriving the zinc of an amount of magnesium sufficient to satisfy the stoichiometric requirements of the silicon.

In Table IV, the gross ratios of zinc-to-magnesium are listed, and also the "effective ratios" of zinc to the magnesium remaining after Mg_2Si is formed. The silicon content is assumed to be 80 per cent of the maximum allowed, and it combines preferentially with 1.74 times its own weight to form Mg_2Si, leaving less magnesium for the zinc.

In Table IV[2], the stoichiometric amounts of the ratio of zinc-to-magnesium are shown as 5.4 for $MgZn_2$ and 2.7 for $Al_2Mg_3Zn_3$. In one alloy composition, however, ZC81A and B, there is no magnesium left after the silicon has been saturated, consequently the ratio is infinity; no zinc-magnesium compound can form. In two other alloy compositions, ZG61A and ZG61B, the zinc-magnesium ratios are 25.4 and 13.3, meaning that there is only a small amount of magnesium available for the zinc, and only a minor amount of $MgZn_2$ can form. These three alloys, therefore, become principally aluminum alloys with Mg_2Si and zinc in solid solution. If we consider the small amount of copper present, they may also contain aluminum-copper or aluminum-copper-magnesium compounds. Bonsack[3] explains that ZG61A is based on the original Guertler and Sander patent[4] covering an alloy of aluminum with $MgZn_2$, which was revived in the Fuller-Basch patent[5] and improved by Comstock[6]. He also calls attention to the still higher zinc content and lower magnesium content of ZC81A and B and ZG61B.

TABLE 4 . . . RATIOS OF ZINC-TO-MAGNESIUM IN STRONG ALUMINUM CASTING ALLOYS WITH NOMINAL AMOUNTS OF REQUIRED ELEMENTS PRESENT

Alloy	Gross Ratio	Effective Ratio*
ZC81A&B	21.4	infinite
ZG32A	1.9	2.3
ZG42A	2.0	2.3
ZG61A	9.8	25.4
ZG61B	9.3	13.3
Required for $MgZn_2$	...	5.4
Required for $Al_2Mg_3Zn_3$	...	2.7

*If silicon is present at 80 per cent of the maximum amount permitted.

With the other two alloys in Table IV, ZG32A and ZG42A, the situation is entirely different. The effective ratio of zinc-to-magnesium in these two is about 2.3 if the silicon is at 80 per cent of maxium. The ratio required to form the hardening compound $Al_2Mg_3Zn_3$, which is the strong hardening compound of the patents[7] is 2.7, just enough higher to compensate for a possible small magnesium loss in melting. Thus these two alloys have the correct amounts of zinc and magesium to form the ternary constituent $Al_2Mg_3Zn_3$ and are distinguished from the others within the same group.

A comparison of the hardening effect of the two alloying compounds, the ternary constituent $Al_2Mg_3Zn_3$ and the binary constituent $MgZn_2$, indicates some differences between

TABLE 5 . . . TYPICAL MECHANICAL PROPERTIES OF ZG32A and ZG42A ALUMINUM ALLOYS

Alloy	Condition	Sand-Cast: Tensile Strength psi	Sand-Cast: Yield Strength 0.2% Set, psi	Sand-Cast: Elongation % in 2 in.	Sand-Cast: Brinell Hardness 500 Kg. 10 mm.	Chill-Cast: Tensile Strength psi	Chill-Cast: Yield Strength 0.2% Set, psi	Chill-Cast: Elongation % in 2 in.	Chill-Cast: Brinell Hardness 500 Kg. 10 mm.
ZG32A	As Cast	29,000	13,000	12.0	50	33,000	15,000	22.0	55
ZG32A	Aged 21 days	35,000	19,000	9.0	65	42,000	21,000	18.0	70
ZG42A	As Cast	30,000	19,000	5.0	65	42,000	24,000	14.0	75
ZG42A	Aged 21 days	37,000	27,000	3.0	85	47,000	29,000	8.0	85
ZG42A	T6	44,000	40,000	1.5	80	49,000	36,000	9.5	95
ZG42A	T7	43,000	38,000	1.5	80	53,000	43,000	6.5	95

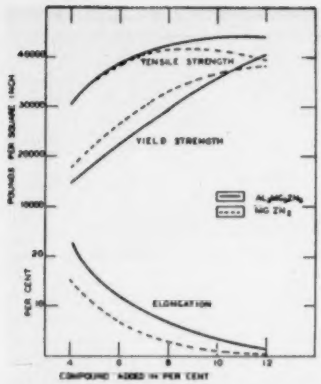


Fig. 12 . . . Hardening effects of magnesium and zinc in aluminum illustrated by influence of binary and ternary intermetallic compounds.

the effects of the two. In Fig. 12 are plotted the tensile properties of chill-cast aluminum alloys containing 4 per cent, 6 per cent, 8 per cent, and 12 per cent of $Al_2Mg_3Zn_3$ and also of chill-cast aluminum alloys containing the same percentages of $MgZn_2$. The ternary compound is more effective in increasing the ductility of aluminum and the binary compound gives higher yield strengths for equivalent amounts of compound. The ultimate strengths are very close together, with perhaps an edge in favor of the ternary compound.

The ternary phase diagram of the system aluminum-magnesium-zinc at room temperature, Fig. 13, explains graphically the important position of the tenary field (T) and the area aluminum plus the ternary compound, (α plus T), in which lie ZG32A and ZG42A. These alloys are two of a series commercially available which usually have from 5 per cent to 8 per cent of the ternary compound. They are the only commercial alloys in this area. The binary alloys of aluminum and $MgZn_2$ fall into the narrower band below the ternary band, but because of the composition differences previously mentioned the other alloys are difficult to place in a simple diagram.

While minimum mechanical properties of the strong alloys are shown in Tables I and II, typical values for these properties are higher, and for ZG32A and ZG42A they are listed in Table V in both the sand-cast and chill-cast conditions. The values shown "as cast" are typical of the first 24 hours after casting, and the aged values are typical after the ASTM elapsed time of 21 days. The latter values can be secured also by aging at 210 F for periods of about 8 hours.

The exceptionally high elongation of ZG32A, particularly immediately after casting, permits forming operations which could never be performed on the usual aluminum alloy, even before heat-treatment. ZG42A can also be further improved in some respects by heat-treatment. Heat-treated mechanical properties also are shown in Table V. The solution treatment consists of a quench in cold water after several hours at 980-1000 F. Aging 3 to 5 hours at 300 F gives T6 values, and overaging 4 to 6 hours at 350 F gives T7 values.

Aging is slow

The compounds responsible for the high properties of these alloys precipitate slowly; thus the high properties secured immediately after casting are subject to change with aging. The tensile and yield strengths and hardnesses increase sharply at first and approach stability after a few weeks.

The elongations decrease in the same manner, but the drop in elongation takes place much more slowly than it does with the precipitation hardening of the older heat-treated alloys in which the hardening compounds are of the copper or magnesium-silicide types. Rates of change in these properties for sand cast ZG32A and ZG42A are illustrated in Fig. 14 and 16, and for the same alloys chill cast in Fig. 15 and 17. Intermediate alloys with 6 per cent of the ternary compound and with 8 per cent are old enough to have five-year results available so they are included for the sake of comparison.

Properties superior

It is evident from these curves that for practical purposes the aging is complete after the first few months, and that the permanent properties of all the alloys of this class are superior to those of the usual aluminum castings heat-treated, discussed in the opening paragraphs. ZG32A will prove superior in places where toughness and high elongation are required. Where high yield strength is required, one of the others is selected, and the already high mechanical properties of ZG42A can be further increased by heat-treatment.

There are also certain specific minor elements which affect the properties of these high-strength alloys to a greater degree than would be expected by the small amounts allowed to be present. These have been discussed in some detail by Bonsack[8] and by Whitaker[9], the latter dealing primarily with their effect on corrosion resistance. E. H. Dix, in his Campbell Memorial Lecture of 1949[11] discusses the wrought aluminum-magnesium-zinc alloys thoroughly.

Copper is perhaps the most prominent minor element in these alloys because it is so prevalent in other aluminum alloys, and accidental contamination is possible. Both Bonsack and Whitaker recommend that it be kept low to prevent corrosion. Since corrosion resistance is an outstanding characteristic of ZG32A and ZG42A, the copper content of these is kept to a very low limit. Furthermore, copper has a harmful effect on ductility; the high elongation of ZG32A would be cut in half if 0.75 per cent copper were added.

Silicon, also easily picked up in an aluminum foundry, is closely con-

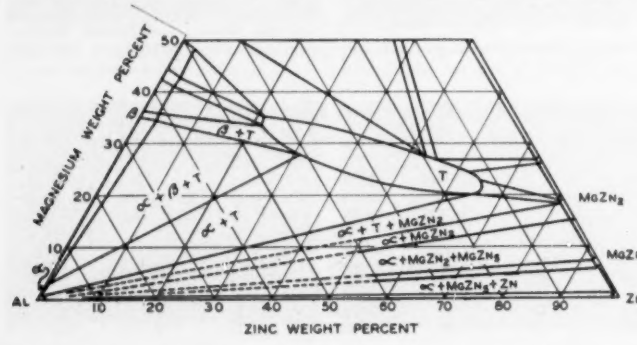


Fig. 13 . . . Room temperature distribution of phases in ternary system of aluminum, magnesium, and zinc. Story describes areas containing important alloys.

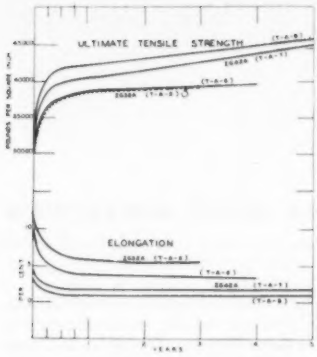


Fig. 14 . . . Effect of room temperature aging on sand-cast ternary alloys.

trolled in all of these high-strength alloys. The highest maximum amount allowed by the specifications described in Table III is 0.3 per cent and ZG61B limits silicon to a maximum of 0.15 per cent. The necessity for keeping the silicon down was explained previously.

Iron is of course present in all aluminum alloys. It should be kept as low as possible in those high-strength compositions because of its effect on elongation. Bonsack feels that it can be tolerated up to 1.0 per cent[8], and the specifications mentioned above allow up to only 0.5 per cent in ZG61B, 0.8 per cent in ZG32A and ZG42A, 1.0 per cent in ZG61A, and 1.0 per cent or 1.3 per cent in ZC81A and B respectively.

Manganese is variously limited in these alloys, as shown in Table III. The specifications allow maxima of only 0.05 per cent manganese in ZG61B, 0.3 per cent in ZG61A, and 0.6 per cent in ZC81A and B. In ZG32A and ZG42A, however, it is a required addition at 0.5 per cent because of its toughening effect. In Fig. 18 it will be noted that the combination of highest elongation and tensile strengths is at about 0.5 per cent manganese when 0.25 per cent chromium is present.

Chromium is outstanding in its effect on the tensile properties. An addition of about 0.3 per cent not only raises the tensile and yield strengths and hardness, but raises the elongation at the same time. Chromium, therefore, is a required element in ZG32A, ZG42A, and ZG61A.

Titanium has been recognized as a potent grain-refining element, although its effectiveness is much less if it is allowed to exceed 0.2 per cent due to its hardening effect.

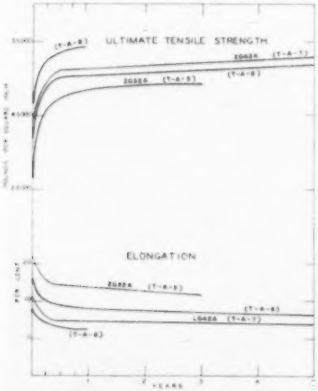


Fig. 15 . . . Room temperature aging of chill-cast ternary alloys shows tensile strength levelling faster than in Fig. 14.

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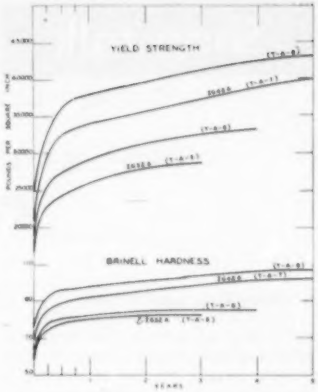

Fig. 16 . . . Yield strength and hardness of sand-cast ternary alloys show increase over 5-year period.

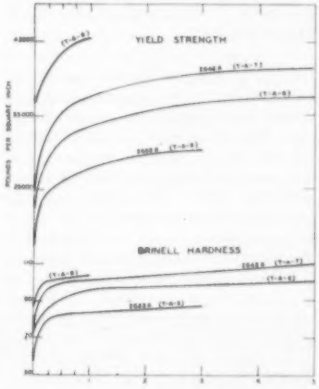

Fig. 17 . . . Chill-cast alloys continue to show aging through five years.

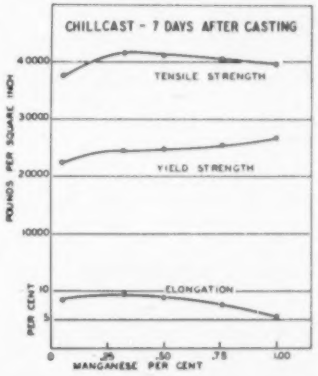

Fig. 18 . . . Influence of manganese on properties of chill-cast ternary alloys with 0.25 per cent chromium.

Shop talk

Practical questions and answers

▶ *Aluminum and bronze*

We have a supply of aluminum and bronze chips which have become mixed, caused by the closeness of one machine running bronze to another running aluminum. There may be a small amount of magnesium in the chips. Is there any way of separating the two or three kinds of chips, and what kind of equipment would be needed?

This might be accomplished by means of gravity concentrating devices such as used by mineral dressers. The particular machine would depend on the physical properties of the two metals, such as particle shape and size. Such devices as a jig or gravity shaking table might work if the particles are not too big and if they are somewhat equidimensional. If a large percentage of the particles are corkscrew in shape, a heavy media separator using a suspension of finely ground ferrosilicon or magnetite to maintain a high density medium might be used. The specific gravity of the medium can be set at a density in between that of aluminum and bronze, thus floating off the aluminum and concentrating the bronze in the sink product. In this type of concentrator, particle shape causes little trouble, but the particle size of the materials to be separated should be plus 10 mesh. Heavy media separators are manufactured by several companies.

WILL MITCHELL, JR.
Asst. Dir. of Res.
Allis-Chalmers Mfg. Co.
Milwaukee

▶ *How to melt shavings*

We experimented with the use of steel and cast iron shavings added in our cupola to a reduced coke charge. Silicon carbide was also added. Claims that the process resulted in coke economy and increased casting quality were found not justified. Have other foundries experimented with this same process?

We know of no foundry that has utilized this particular process although some shops used to shovel in turnings at the end of the heat. Blast was reduced to avoid loss of small particles. The metal usually was pigged. Today it is general practice that where steel or gray iron turnings are used in the cupola charge, they are first briquetted in hydraulic presses. In this form considerable tonnages are successfully utilized in the form of 11-lb briquets. Ten per cent of the metal charge as briquets is not uncommon and some shops use more.

Latest development in utilization of borings is a device developed in England for feeding borings directly into the cupola. Up to 25 per cent of the charge is made up by mechanically introducing the borings just above the melting zone. The borings are fed into a chute at charging floor level (no flux on binder is added) and injected into the furnace by strokes of an air-operated ram.

▶ *Ferromanganese additions*

The A.F.S. Cupola Handbook *mentions the limitations of ferromanganese ladle additions as follows: "Gas may be generated in the mold when relatively large manganese adjustments are made. This condition, however, seems to be dependent on the composition of the base iron." We would appreciate some quantitative*

continued on page 100

now, there's an idea!

■ Greater safety and increased production resulted from a suggestion developed by Paul Kelly and Odie Savell of Electric Steel Foundry Co., Portland, Ore. They hooked up an air hose to the sliding jig used in cutting wedges and with only a very little air stream blow the wedges into a barrel as they are cut off. A carpenter no longer has to reach for each wedge to toss it into the barrel, an operation which formerly took about 50 per cent of the cutting time. In addition, the idea increases the safety on the job by eliminating the need to get fingers close to the saw.

Guard is raised on rip saw to show how air nozzle fastened to jig blows wedges into barrel, increasing production and avoiding hazard of reaching near saw.

Save by redesigning non-cast parts for *Production in gray iron*

The Redesign Contest is sponsored annually by the Gray Iron Founders' Society for the purpose of promoting replacement of non-cast materials with gray iron castings. Award money this year, totaling $500, was distributed equally to five contestants.

■ Winning entries in the 1952 Redesign Contest sponsored by the Gray Iron Founders' Society include a gear cover for a braiding machine, a cable drum, a base for an automatic lathe, a gear box for a power-driven saw, and the receiver tank for a boiler feed pump unit. These were submitted respectively by George K. Green, Textile Machine Works, Reading, Pa.; W. F. Geppert, Acme Foundry, Inc., Tacoma, Wash.; Frederick Waters, Seneca Falls Machine Co., Seneca Falls, N. Y.; A. J. Schmidbauer, Iroquois Foundry Co., Racine, Wis.; and A. C. Hauser, Pitz Foundry Inc., Brooklyn, N. Y.

In each case, tests have shown that the new designs are superior in actual use and give promise of a longer service life. Each offers substantial savings.

Take the gear cover for a braiding machine. Formerly it was fabricated from nine pieces of sheet metal, as shown in Fig. 1 and 2. These pieces were cut to a pattern, formed to shape, and butt-welded. After welding, parts of sections (see arrows) were cut out to complete the operation. Cutting was done after welding to eliminate warping.

To complete the assembly of one such cover required 8 to 10 hours at a corresponding high cost.

To save time in duplicating many parts and to lower the unit cost it was decided to replace the sheet-metal assembly by castings. A few changes were made to streamline and modernize the design, and a little weight was added for castability. The wall thickness of the casting is 5/32 in., with the exception of the additional flat section across the top, which is approximately ⅜ in. The wall thickness of the fabricated cover was 3/32 in.

For simplicity a matchplate pattern was made, requiring only a green sand core, Fig. 3. Finished and machined, the casting cost less than one-tenth the production cost of the weldment. Pattern-equipment costs were written off after the production of only 100 castings.

Figure 4 shows a cable drum redesigned as a gray iron casting. Demand for the drum had been spotty, and never for large quantities. Long-run production methods, therefore, could not be employed. Accordingly, the drum had been made by cutting, assembling, and welding plates of varying thicknesses. Grooves for a ⅜ in. cable, the bore, and the keyseat had been machined. Results of

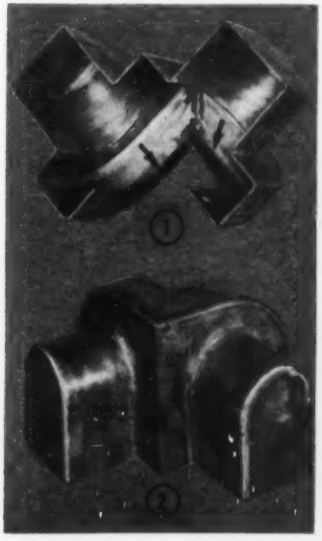

Fig. 1 and 2 . . . Gear cover welded from nine pieces. Arrows show cut-outs.

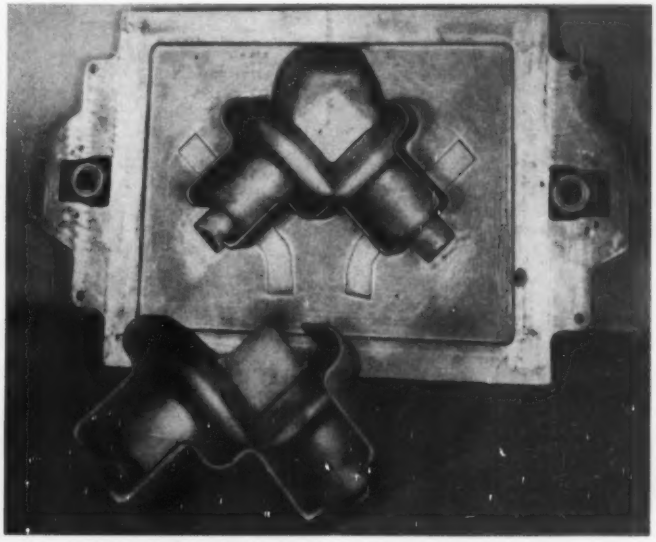

Fig. 3 . . . Matchplate and cast gear cover. Made entirely in green sand, the castings were produced at one-tenth the cost of the weldments shown at left.

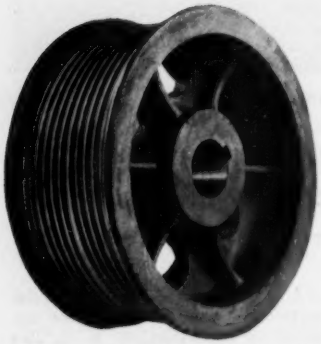

Fig. 4 . . . Drum with cast-in grooves.

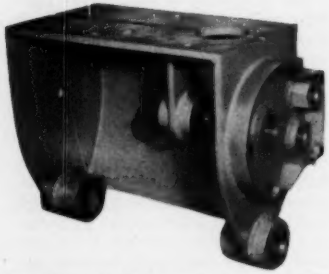

Fig. 5 . . . Welded gear box was costly.

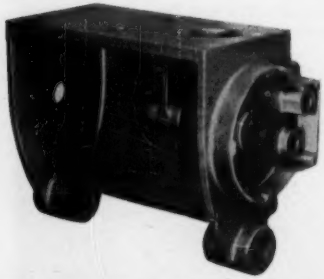

Fig. 6 . . . Cast gear box saved money.

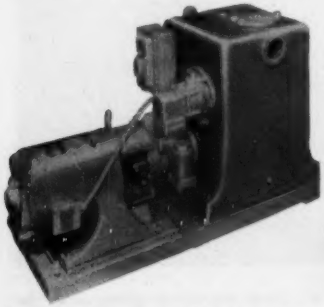

Fig. 7 . . . Cast tank has longer life.

redesigning cable drum as a casting: machine time was considerably reduced since the cable grooves were cast, the unit was stronger, its operating life was lengthened because of the superior resistance of gray iron to metal-to-metal wear and galling. Appearance was improved. Cost of the pattern was written off with the first order of 20 units, and total savings to the customer on the first order were $197. The over-all cost was cut 41 per cent per unit.

The maker of a power-driven metal saw had been installing gear boxes made by welding pieces of plate, as illustrated in Fig. 5. The weldment was found to be unprofitable, however, and he asked to have the unit redesigned as a gray iron casting. In the redesigned unit, shown in Fig. 6, the cost of the gear box was reduced by 41 per cent from the original fabricated design. A further saving of 41 per cent was realized on machine and labor costs.

In the manufacture of boiler feed pumps, the chief problem was caused by deterioration of the light-gauge sheet metal used in making the receiver tank. Contact with water caused a rapid breakdown of the metal and necessitated replacing the tank within a period of five years. To avoid periodic replacements, the manufacturer redesigned the receiver tank for casting as shown in Fig. 7.

Initial cost of the casting was nearly double that of the steel tank. In spite of the cost difference, however, the casting had several advantages:

The new design permitted close assembly of integral parts and so reduced space requirements. It also reduced the need for wiring, pipe, and fittings, with a corresponding reduction in labor and material costs. Furthermore, it far surpassed the steel tank in longevity of service. Expense of replacing the steel tank, with the cost of labor and fittings added amounted to 38 per cent higher cost than that of the casting. By using the cast-iron tank, therefore, over each five-year period a savings of 38 per cent can be effected and will be realized every five years during the life of the casting, which is estimated to be 50 years.

Seneca Falls Machine Co. formerly used fabricated steel for the base of the automatic lathe the company makes. They then redesigned the base to be cast in gray iron, as shown in Fig. 8.

"As a result," said Frederick D. Waters, foundry superintendent, "we have a material that is less expensive and, because of simplicity of casting design, an easy base to produce. Delivery time has been cut to about one-eighth that of the fabricated steel unit. Because of the rigidity we have put into the casting we have a base which is easy to machine, absorbs vibration, and does the kind of job our customers expect."

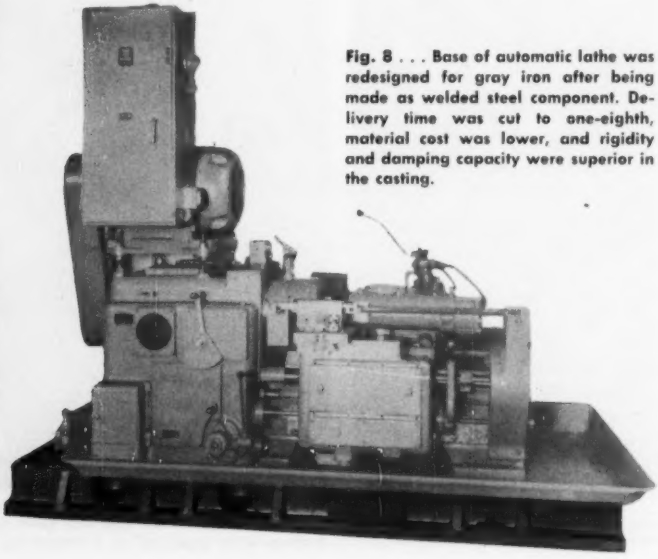

Fig. 8 . . . Base of automatic lathe was redesigned for gray iron after being made as welded steel component. Delivery time was cut to one-eighth, material cost was lower, and rigidity and damping capacity were superior in the casting.

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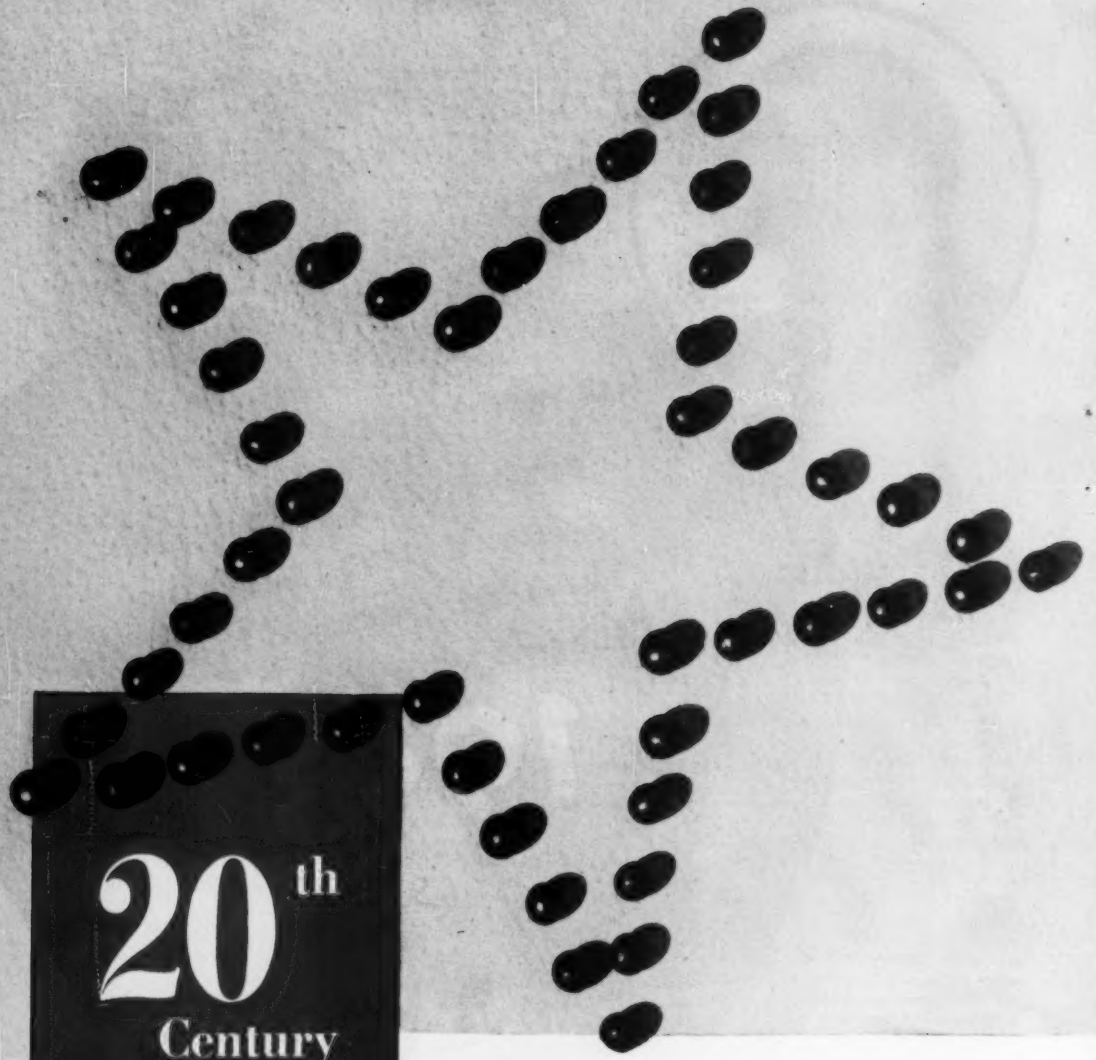

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Controlled quality highlights Metals Casting Conference

■ Customers' viewpoints and how to meet their needs made up the theme of the 5th Annual Metals Casting Conference held at Purdue University October 30 and 31. Some 240 representatives of midwestern foundries attended the sessions to learn buyers' views, quality control methods, shell molding, and materials handling. Sponsors of the conference were the Michiana and Central Indiana Chapters of A.F.S. and Purdue.

Lewis D. Reiff, Superior Malleable & Steel Castings Co., Benton Harbor, Mich., chairman of the conference, set the stage for the two-day meeting with a statement of the theme and then introduced H. A. Bolz, Department of General Engineering, Purdue. Prof. Bolz, who presided at the opening session, reminded conference attendants that they were there to learn from each other. In an official welcome on behalf of the university, E. W. Comings, Chemistry and Metallurgy Dept., told how Purdue serves industry by supplying men and ideas to help solve industrial problems.

Shell molding talk by Wilbur S. Walters, LaGrange Shell Molders, Inc., LaGrange, Ind., drew capacity crowd of intent listeners. For complete paper see page 42.

Manpower problems

I. R. Wagner, Electric Steel Castings Co., Indianapolis, Ind., and president of A.F.S., discussed manpower problems following a tribute to A. A. Potter, dean of engineering. Warning that the industry must carefully integrate college trainees with shop trained men, Mr. Wagner said foundrymen must recognize and use properly two types of individuals. They are, he said, those who absorb information rapidly, and those who do not absorb information rapidly but who do a fine job on the basis of the knowledge they already have.

The trend seems away from apprenticeship, Mr. Wagner declared, in questioning whether the foundry industry knows whether it needs more college trained and less shop trained men or not. He indicated a survey might be required to determine this so the industry could be guided in its future recruiting and training work.

Joseph P. Stanton, Ford Motor Co., Detroit, outlined the factors which influence a castings buyer in his talk on *"The Buyer's Viewpoint."* A buyer expects a supplier, he said, to produce parts in accordance with blueprints and specifications, to produce quantities as authorized and to deliver them on time, and to sell at a satisfactory cost, FOB point of consumption. To qualify on these points, he stated, it is essential that a firm have:

1. A progressive approach to mechanization and the use of the most efficient machinery and equipment available.
2. A sensible labor relations program.
3. Some plan for research and development.

Mr. Stanton closed with a reminder that the first requisite of a good supplier was to produce parts to specification and urged his listeners to use quality control to minimize defective castings and to keep them out of the plants of the customers.

Speaker at the first session in the afternoon was Frank G. Steinebach, *Foundry*, Cleveland, who spoke on the *"Present and Future of the Casting Industry."* Chairman was R. W. Lindley, Manufacturing Processes, Purdue. The speaker reviewed progress of the industry since 1940, stating that capacity has approximately doubled in the past 12 years. Looking into the future, he saw continued demand for labor-saving equipment. The industry needs, he said, even greater improvements in working conditions than have been achieved, improved safety, more engineers on the management team, greater standardization of procedures, more intelligent merchandising, and better use of available technical material.

Redesign of castings

Two speakers shared the second session of the afternoon. Robert Franck, Superior Malleable & Steel Castings Co., Benton Harbor, Mich., described the redesign of castings and illustrated the use of clear plastic and clay models, the claying of patterns to change designs, and the use of brittle lacquer and strain gauges.

E. Crowell Knight, Ross Gear & Tool Co., Lafayette, Ind., the second

speaker, emphasized the importance of establishing locating points and of designing castings so they require minimum handling in the machine shop. He recommended the use of models so everyone involved in production can study a part and advise on modifications which will simplify production.

Wm. G. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich., presided at the session.

Principal speaker at the conference banquet the evening of the first day was Alfred P. Haake, General Motors Corp., Consultant of Park Ridge, Ill. Speaking on *"Building for Tomorrow,"* he outlined the fundamentals of economics and pointed out the importance of an individual or a government living within its income. He decried government policies which, he said, are based more and more on expediency rather than principle. Dr. Haake was introduced by S. D. Martin, Central Foundry Div., GMC, Danville, Ill.

Quality control is emphasized to engineers and buyers by Ed Price, Dayton Malleable Iron Co., Ironton, Ohio, who presented paper with O. K. Hunsaker.

Quality control

Toastmaster for the banquet was Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, Indianapolis. Entertainment included dual piano selections by Prof. R. W. Lindley and his son, J. F. Lindley, both on the engineering faculty.

"What Quality Control Means to Engineering and to Buyers of Castings" was told by E. F. Price and O. K. Hunsaker, Dayton Malleable Iron Co., Ironton, Ohio, at the first session the morning of October 31. Using a combination of motion pictures to illustrate various foundry operations, and slides to illustrate quality control records, Mr. Price outlined procedures practiced by his company. Quality control is not a cure-all which will make good operations out of bad operations, or good castings out of bad, he warned, but use of control charts will indicate when action should be taken to correct an operation or repair a piece of equipment. The charts merely indicate, he said, but they do not do the correcting.

Success of a quality control program depends upon these four factors, according to Price and Hunsaker:

1. Collecting the proper data.
2. Relaying the data to the proper authority for action.
3. Prompt action as a result of this information.
4. Close cooperation among all members of the organization.

Allen A. Evans, International Harvester Co., Indianapolis, presided at the quality control session.

An indication of control of quality possible with shell molding was given by Wilbur S. Walters, La-Grange Shell Molders, Inc., La Grange, Ind., at the next meeting. In a talk which appears in its entirety in this issue (page 42), Mr. Walters described typical shell mold castings turned out in his plant and discussed the rotation method of producing shell cores. Harry L. Day, Auto Specialties Mfg. Co., St. Joseph, Mich., was session chairman.

Final technical session featured K. F. Lange, Link-Belt Co., Chicago, speaking on *"Materials Handling in the Foundry."* B. E. Gavin, National Malleable & Steel Castings Co., Indianapolis, presided.

About half the hours expended in the foundry are required for materials handling, Mr. Lange said, in pointing out that 150 to 200 tons of material are handled and rehandled to produce one ton of castings. These facts, he declared, show why a sound approach to materials handling is necessary. He enumerated the following steps in formulation of a foundry materials handling system:

1. An accurate analysis must be made of capacities required to meet the sales potential.
2. A careful study should be made of present equipment and existing building facilities.
3. A study must be made to try to obtain straight-line flow in the production processes from the entrance of raw materials in the plant to the finished castings leaving the shipping room.
4. A flow sheet and plant layout should be prepared for discussion with foundry personnel and top administrative staff members.
5. Finally, a more detailed layout is developed, each department being studied separately, then integrated into the whole.

L. L. Andrus, American Wheelabrator & Equipment Corp., Mishawaka, Ind., closed the conference with a review of the success of the five Metals Casting Conferences and a tribute to those who planned them and carried them out.

Assisting Conference Chairman Reiff and James Barrett, National Malleable & Steel Castings Co., Indianapolis, who was program chairman with planning the 1952 conference were the following: H. O. Bailey, Sonith Industry, Indianapolis; Wm. G. Ferrell; Fred Kurtz, Electric Steel Castings Co., Indianapolis; A. E. Peterson, Oliver Corp., South Bend, Ind.; E. G. Richardson, Delco Remy Div., GMC, Anderson, Ind.; Carl Schopp, Link-Belt Co., Indianapolis; Vern Spears, American Wheelabrator & Equipment Corp.; James Strom, Strom Brass Foundry, Elkhart, Ind.; and H. A. Bolz, the late George M. Enos, R. W. Lindley, C. T. Marek, and M. M. McClure, all of Purdue University.

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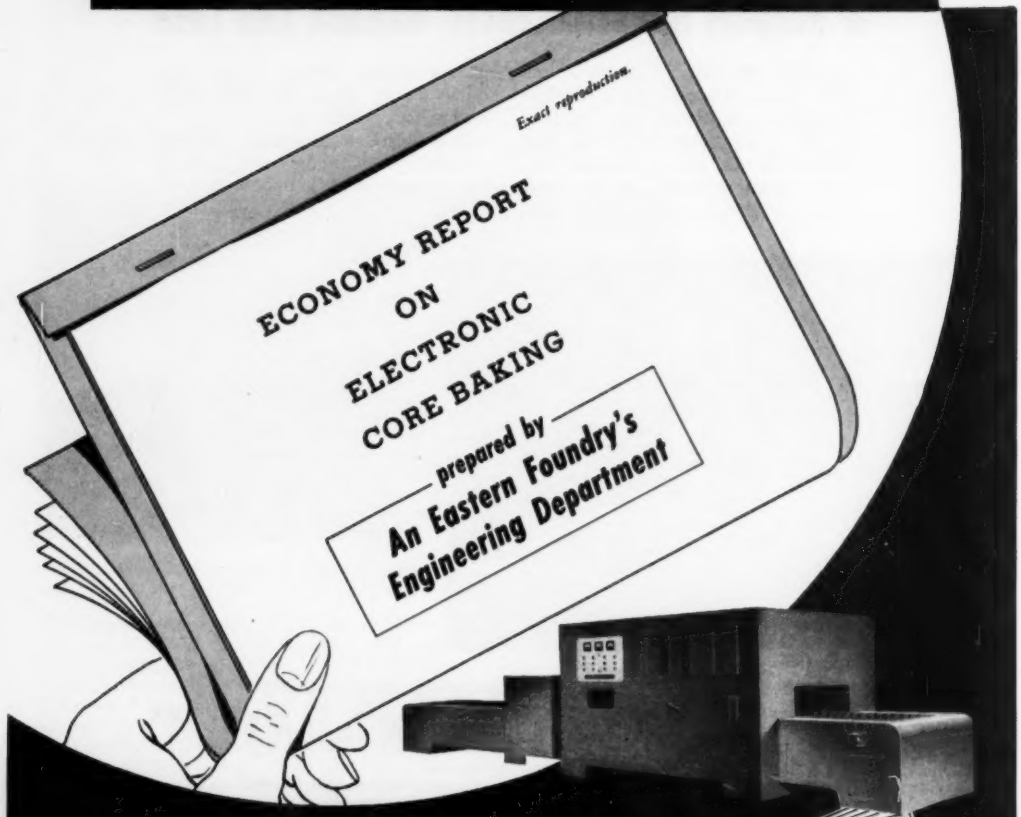

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Southwestern Regional features sand control and reclamation

In its third year, the Southwestern Regional Foundry Conference included among its sponsors the Tri-State Chapter of A.F.S. The regional was started in 1950 by the Texas Chapter with the Texas A & M Student Chapter cooperating. Chairman of the conference for the third successive year was James R. Hewitt, Houston, Texas, assisted this year by Dan A. Mitchell, Progressive Brass Mfg. Co., Tulsa. Helping *American Foundryman* report the two-day meeting were Prof. Lloyd G. Berryman, Texas A. & M. College, and E. J. Sandoval, student chapter chairman.

■ Sand, melting, gating and risering, costs analysis, safety, mechanization, and casting defects were highlighted in the technical session of the Third Annual Southwest Regional Foundry Conference. Held in Dallas, Texas, at the Baker Hotel November 13 and 14, the conference was sponsored by the Texas Chapter, the Tri-State Chapter, and the Texas A. & M. Student Chapter.

The conference opened with two papers on sand. Earl E. Woodliff, Detroit, spoke on *"How Far Must We Go in Sand Control?"* Second speaker was Henry W. Meyer, General Steel Castings Co., Granite City, Ill., whose subject was *"Steel Molding Sand."* Co-chairman of the meeting were Malcolm J. Henley, Tyler Pipe & Foundry Co., Tyler, Texas, and Fred E. Fogg, Acme Foundry & Machine Co., Coffeyville, Okla.

No foundry is too small to practice sand control, Mr. Woodliff said, in pointing out that testing is not control. Essentials of control are, he declared, (1) buy testing equipment, (2) assign a man of inquisitive mind to perform tests, and (3) use the results to control sand properties. He suggested blends of natural and synthetic sands as a means of developing desired properties and advised use of bentonite with natural sands for property control and minimum clay balls. Comparatively little synthetic sand is used in the non-ferrous field at present, he said, but there is no reason why synthetic sand can't be used to advantage.

In discussing core sands, Mr. Woodliff asserted that dried sand is preferable because it gives moisture control, that 0.2 per cent bentonite or about 0.5 per cent natural clay bond reduces sagging without seriously increasing oil consumption, and that over 1¼ per cent by weight of cereal binder gives excessive gas without markedly improving resistance to sag.

Collins L. Carter, Albion Malleable Iron Co., Albion, Mich., vice-president of A.F.S., speaking at the Southwestern Regional. Seated, left to right, are the co-chairmen of the meeting, Israel Smith, Western Foundry Co., Tyler, Texas, and D. W. Harris, Frank Wheatley Pump & Valve Mfg. Co., Tulsa, Okla.

F. H. Kobely (right), Columbia-Geneva Steel Div., U. S. Steel Co., San Francisco, preparing projector for his talk on safety and accident prevention following second day's luncheon. Assisting him are E. J. Sandoval (left) and W. C. Moses, chairman and vice-chairman, respectively, of the Texas A. & M. Student Chapter.

Mr. Meyer described sand practice at General Steel Castings Co. where castings up to some 40 tons in weight down to a few pounds, from 70 ft to a few feet in length, and from 14 in. to 7/16 in. section thickness are produced. In spite of this, he said, only five molding sand and four core sand mixes are used. Zircon sand is used in special cases for chilling or to

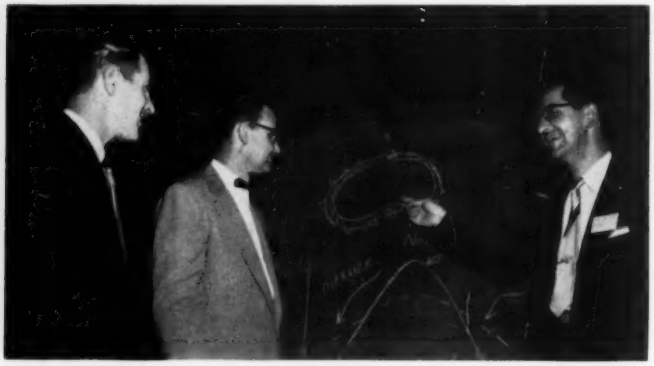
eliminate burn-on, he declared. About 85 per cent of the shop's production is made in an all-purpose, reconditioned sand bonded with bentonite and cereal. To evaluate elevated temperature properties, he recommended using expansion and contraction, hot strength, and thermal shock tests. Expansion and contraction are especially critical in castings susceptible to hot tearing, he stated.

Collins L. Carter, Albion Malleton, presided at this sand session.

Mr. Wenninger said sand in continual use becomes coated with successive layers of binder, forming oversize grains. As the layers chip off, he went on, fines are formed with the result that grain distribution spreads out with more fine and more coarse material than the base sand. The fines require additional moisture, and new sand is needed to get back to a more normal grain distribution, he asserted.

session, with Andrew F. Furlani, East Texas Steel Casting Co., Longview, and Dale Hall, Oklahoma Steel Castings Co., Tulsa, presiding. At the non-ferrous session, Edward Mooney, Federated Metals Div., American Smelting & Refining Co., Whiting, Ind., spoke on *"Gates and Risers for Brass and Bronze Castings"*; co-chairmen were W. G. Coley, Longview Brass & Aluminum Co., Longview, and Dan A. Mitchell, Progressive Brass Mfg. Co., Tulsa.

Gordon L. Killman (left), patternmaker apprentice, Ft. Worth, being introduced by Prof. L. G. Berryman. Seated is R. W. Trimble, Bethlehem Supply Co., Tulsa.



Session Chairmen John G. Collier (left), Garrott Brass & Machine Co., and Lloyd O. Sturkie, Quality Electric Steel Castings, Inc., both of Houston, listen to explanation of coating build-up on sand grains advanced by Clifford E. Wenninger, National Engineering Co., Chicago, sand reclamation speaker.

able Iron Co., Albion, Mich., vice-president of A.F.S., spoke at the luncheon the first day, outlining Society operations and showing how individual and chapter activities fit into the over-all operation. Israel Smith, Western Foundry Co., Tyler, and D. W. Harris, Frank Wheatley Pump & Valve Mfg. Co., Tulsa, Okla., were co-chairmen.

Mr. Carter called attention to the annual A.F.S. Convention to be held in Chicago May 4-8, 1953, to the organization's publications, to the regional conferences, to Society-sponsored research, and to the Safety & Hygiene & Air Pollution Program. He urged intensive support of the latter, pointing out that if the industry didn't take care of its own problems it would be compelled to do so by others less familiar with the foundry industry.

Discussion of sand continued after lunch when Clifford E. Wenninger, National Engineering Co., Chicago, spoke on *"Pneumatic Reclamation of Foundry Sands."* John G. Collier, Garrot Brass & Machine Co., Houston, and Lloyd O. Sturkie, Quality Electric Steel Castings, Inc., Houston, presided at this sand session.

Small particles of silica embed themselves in the clay layers and form "pickle" grains, he declared, which will not slide past each other readily with the result that flowability is low. Hard ramming breaks off the layers forming more fines.

Mr. Wenninger described plant experience with a pneumatic device that causes sand grains to bombard each other, removing layers of clay and fines which build up during use. The equipment he described removes all material smaller than 140 mesh and some 140 mesh. The sand must be free-flowing, he said, and will be with not over 1¼ to 2 per cent moisture (depending on the grain shape) as it comes to the reclaimer.

In the middle of the afternoon, conference attendants broke up into sectional meetings. Ralph Beardon, Great Lakes Carbon Co., St. Louis, spoke on *"Cupola Operation"* at the gray iron meeting. Robert C. Wittlinger, Pioneer Foundry, Houston, and Jackson A. Dean, Nelson Electric Mfg. Co., Tulsa, were co-chairmen. C. K. Donoho, American Cast Iron Pipe Co., Birmingham, Ala., spoke on steel melting practice at the steel session, with Andrew F. Furlani, East Texas Steel Casting Co., Longview, and Dale Hall, Oklahoma Steel Castings Co., Tulsa, presiding. At the non-ferrous session, Edward Mooney, Federated Metals Div., American Smelting & Refining Co., Whiting, Ind., spoke on *"Gates and Risers for Brass and Bronze Castings"*; co-chairmen were W. G. Coley, Longview Brass & Aluminum Co., Longview, and Dan A. Mitchell, Progressive Brass Mfg. Co., Tulsa.

Mr. Beardon discussed the elements of successful cupola operation. Mr. Donoho outlined deoxidation practice and pin hole problems. In discussing use of silicon for killing steels, he advised against use of too much or too little, either condition being conducive to more pin holes, he said. He gave excessive pouring temperature as another cause of pin holes. Best impact properties are obtained, he pointed out, when a combination of calcium, manganese, and silicon is used.

Mr. Mooney described the formation of dendrites during solidification and the problem of moving liquid metal through the openings between the growing crystals to make up for shrinkage. He described a number of gating systems, recommending a "snake" gate for manganese and aluminum bronze to reduce rate of flow and minimize turbulence. He also advised bringing the metal in at the bottom of the riser basin.

Where metal thickness of a bushing in proportion to core diameter is great and penetration is a problem, Mr. Mooney suggested pasting a sheet of asbestos around the core.

continued on page 79

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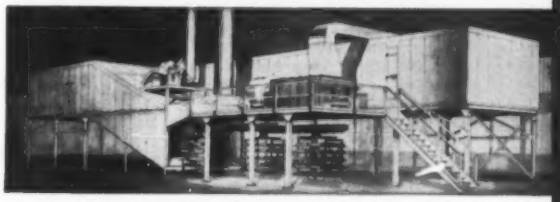

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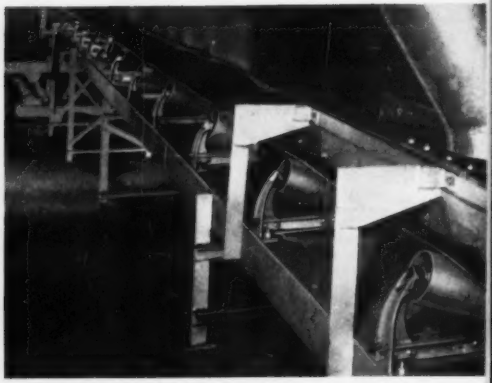
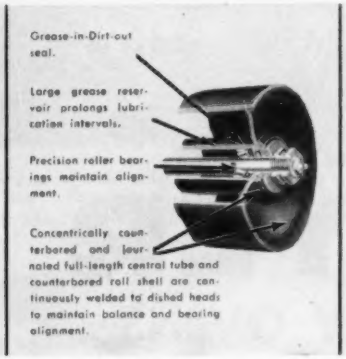


Left: Sand is distributed to molders' hoppers by means of Link-Belt Belt Conveyor employing flat roll idlers. *Right:* Spill-sand is carried on troughed conveyor in tunnel under line of molding machines.

plus LINK-BELT quality components...

Roller bearing L-B Flat Belt Idler.


Grease-in-Dirt-out seal.
Large grease reservoir prolongs lubrication intervals.
Precision roller bearings maintain alignment.
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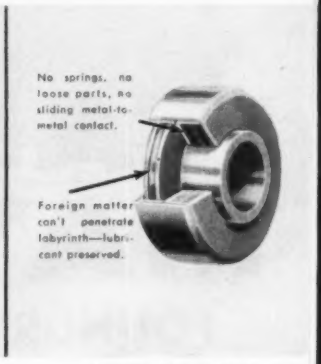
Less lubricant and adjustment.


No springs, no loose parts, no sliding metal-to-metal contact.
Foreign matter can't penetrate labyrinth—lubricant preserved.

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In foundries all over the world, LINK-BELT Belt Conveyors provide reliable, efficient sand handling

OBTAIN the finest in modern sand handling in your foundry. It can be as simple as calling in a Link-Belt foundry specialist while you're still in the planning stage.

Thousands agree Link-Belt builds the finest belt conveyors on the market today. And it has the most complete line of components—all types and sizes of idlers, take-ups, pulleys, plows, bearings and power transmission drives—plus related equipment, including trolley, oscillating and mold conveyors, shakeouts and other sand handling machinery.

Equally important, Link-Belt foundry specialists draw on the broadest background in the industry. They'll work with you and your consultants — help you come up with the right layout for your requirements.

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LINK-BELT

CONVEYORS and PREPARATION MACHINERY

He stressed the value of insulated risers in improving feeding and reducing riser size.

In the evening of the first day, there was a Texas barbecue, with entertainment furnished by Lone Star Steel Co., Dallas.

William Busby, Texas Foundries, Inc., Lufkin, launched the second day's meetings with a paper on *"Use of Standards in Controlling Costs."* He described cost control at Texas Foundries, stating that effective cost control is cost reduction effected by smart management, and that standards are essential for comparison to measure accomplishment.

Among the control aids, said Mr. Busby, is a weekly direct labor control report which summarizes for the foreman the results of his operation. The report shows total hours worked each day by all direct labor operators and just how those hours were used, he asserted. He listed the following operations which, in addition to direct labor, are on incentive based on production standards: cupola charging, spruing, inspect, chip and pack castings, graveling and mudding, pot dumping and sorting, shipping, several assembly operations, materials unloading, furnace tear out, pouring, shifting and dumping castings.

Next speaker was Wm. Ball, Jr., R. Lavin & Sons, Inc., Chicago, who spoke on *"Human Engineering."* He enumerated and discussed the attributes which make for success in an industrial career. Negative characteristics to be avoided or overcome, he asserted, are fear, greed, vanity, envy, and selfishness.

Presiding jointly at the morning meeting were John M. Bird, American Brass Foundry, Ft. Worth, and P. D. Coman, Big Four Foundry, Tulsa.

Luncheon speaker was F. H. Kobely, Columbia-Geneva Steel Div., U. S. Steel Co., San Francisco. He described the Single Objective Safety program in use throughout U. S. Steel and told how early studies indicated that high safety activity correlated with low accident frequency and low operating costs.

Following Mr. Kobely's presentation, the Claude B. Schneible Co. (Detroit) film *"The Invisible Shield"* was shown. The motion picture portrayed the theory and application of modern equipment for controlling dust and freshness and cleanliness of foundry air. James R. Hewitt introduced the film.

Luncheon co-chairmen were Lloyd G. Berryman, Texas A. & M. College, and Robert W. Trimble, Bethlehem Supply Co., Tulsa.

Three group meetings were again held starting the middle of the afternoon. Herman J. Pfeifer, Electro Metallurgical Co., Union Carbide & Carbon Corp., Houston, outlined use of ferroalloys at the gray iron session. He warned that no alloy is a cure-all and that good melting and metal control are essential. After making sure you have a good base iron, he said, select the property you want to improve, and then the alloy. Chairman of the meeting was Wm. Clarkson, III, Oil City Iron Works.

Examining core bake-out test specimen are, left to right; Malcolm J. Henley, Tyler Pipe & Foundry Co., Tyler, Texas; Earl E. Woodliff, Detroit; Fred E. Fogg, Acme Foundry & Machine Co., Coffeyville, Kan.; and Henry W. Meyer, General Steel Castings Co., Granite City, Ill. Messrs. Woodliff and Meyer spoke on sand control.

At the steel session, H. G. Schlichter, Beardsley & Piper Div., Pettibone-Mulliken Corp., Chicago, presented his version of *"The Ideal Steel Foundry."* He discussed mechanization of a 120-ton jobbing shop to bring it up to 300 tons per month. B. V. Thompson, Texas Steel Co., Ft. Worth, and B. P. Glover, M. A. Bell Co., acted as co-chairmen.

Donald L. LaVelle, Federated Metals Div., American Smelting & Refining Co., Barber, N.J., illustrated and described casting defects and remedies at the non-ferrous meeting. J. G. Winget, Reda Pump Co., Bartlesville, Okla., introduced the speaker.

If the cope is dark and the drag side clean, badly gassed metal is indicated, said Mr. LaVelle. Rate of gas pickup is higher at higher temperatures, he warned, advising heating not over 50 F above required temperature. Bad pouring, with entrapment of air and dross, is responsible for many defective castings, he asserted.

The conference ended with a banquet presided over by P. B. Croom, Houston Pattern Works, and D. W. Harris. A.F.S. Vice-President Carter spoke briefly on the Society, stating that its chief objective is to advance the arts and sciences of production and utilization of castings. The organization is a team, he declared, on which all foundrymen can play for their mutual advantage. Final speaker was Louie E. Throgmorton, Republic National Life Insurance Co., Dallas, who gave an inspirational talk, *"The Point After Touchdown."*

Throughout the conference there were luncheons, entertainment, and a reception for the ladies.

Assisting Co-Chairmen Hewitt and Mitchell with conference plans were the following committees headed by the following committees headed by the men named: Publicity—W. Alex Beardon, M. A. Bell Co., Houston, and Fred E. Fogg; Program—W. H. Lyne, III, Hughes Tool Co., Houston, and R. W. Trimble; Finance—Lloyd O. Sturkie and Jackson A. Dean; Arrangements—Wilbur A. Bittel, Royall Fire Brick & Supply Co., Dallas, and Charles Sibbitt, Refinery Castings Co., Dallas; and Registration—E. W. Wey, Dee Brass Foundry, Houston, and W. H. Mook, Bethlehem Supply Co., Tulsa, assisted by J. C. Calhoun, Dee Brass.

Letters to the editor

All letters of broad interest which do not violate A.F.S. policy or good taste are publishable. Write to Editor, American Foundryman, 616 S. Michigan Ave., Chicago 5, Ill. Letters must be signed but will be published anonymously on request.

Management explains

The October issue of AMERICAN FOUNDRYMAN contained a letter signed Disturbed Foundryman (Letters to the Editor, page 105), objecting to the special privileges which the writer felt were being given to college graduates in his company. It is impossible to comment on the particular situation he described without knowing something about the organization and its practices, but, if his attitude is prevalent in the plant, it would seem that the company has failed to do a good job of integrating college men into the organization.

Regardless of the particular facts in this man's plant and his own bias, the letter does raise a general problem of importance. I do not believe that there are many foundrymen, or for that matter educators, who think that a college degree is in any way a substitute for brains, character, or application.

Furthermore, we all know people who missed the opportunity to attend college, but who have nevertheless been more successful than the majority of college people. Such a fact, of course, has no bearing on the value of college training, since the successful non-college person could well have been a still greater success if he had been able to spend more time acquiring basic knowledge. The broad experience of American business confirms the idea that, on the average, men benefit from college training, and that the man who possesses it will usually have an advantage over another of equal ability who lacks it.

If college education has the worth which I ascribe to it, the foundry industry is doing a reasonable thing when it attempts to bring more graduates into its employ. However, this must obviously be done in such a way that other valuable employees do not get misconceptions, such as those which seem to have been developed by Disturbed Foundryman.

NEED PRACTICAL EXPERIENCE TOO

The college graduates themselves must learn that an education is an asset which can only prove its true value if it is combined with practical experience, and that practical experience can be acquired most easily if one appreciates and respects those who already possess it.

Management should adopt equitable training and promotion policies which will provide incentives for all employees to improve themselves. If such policies are made effective, I believe that college men will be accepted in a foundry without friction and will in a relatively short time become an integral part of the management team.

ANTHONY HASWELL, *President*
Dayton Malleable Iron Co.
Dayton, Ohio

Wants questions answered

I read with interest the letter of Disturbed Foundryman in the October issue of AMERICAN FOUNDRYMAN. Having read it over a couple of times, I can only assume that either he is working for the wrong company or else he doesn't know what he's talking about.

He says that the college graduates in his company get special consideration, greater opportunity, and higher starting salaries than those with practical experience and years of service. Does he know this to be true? Or is he only believing rumors, or guessing?

I do not know who Disturbed Foundryman is or what company he works for, but it's unbelievable that any foundry or any business wouldn't prefer, *much prefer*, to use people from their own ranks rather than bring in outsiders, assuming, of course that both are equally qualified.

He says "evidently the company thinks it is getting them ready made and won't have to build men with brains and character as they used to." Apparently they didn't build much character into him or he would not be reflecting the disgruntled, sour-grape attitude demonstrated in his letter.

NOT INTERCHANGEABLE

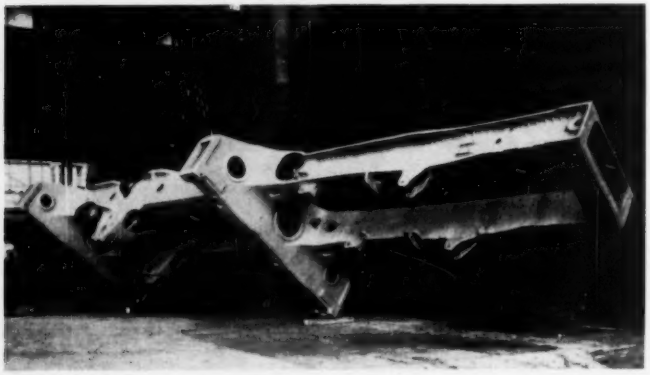
Disturbed Foundryman asks: "How many years of experience does a college degree equal?" In my opinion a college degree doesn't equal any certain number of years of experience. Nor do years of experience equal a college degree. Mere familiarity with something by reason of daily association doesn't necessarily imply technical or detailed knowledge of the subject.

He says the trainee gets a break because of the flexibility of his work—he isn't tied down to a job but gets to roam the shop solving problems out of the realm of the ordinary worker. Of course that is a question of the point of view. In the eyes of Disturbed Foundryman this is a golden opportunity. In the eyes of a Disturbed College Trainee, the same situation may appear extremely irksome, as though he were being buffeted around, shoved from pillar to post, without any specific job or specific place in the organization.

TAKE INVENTORY

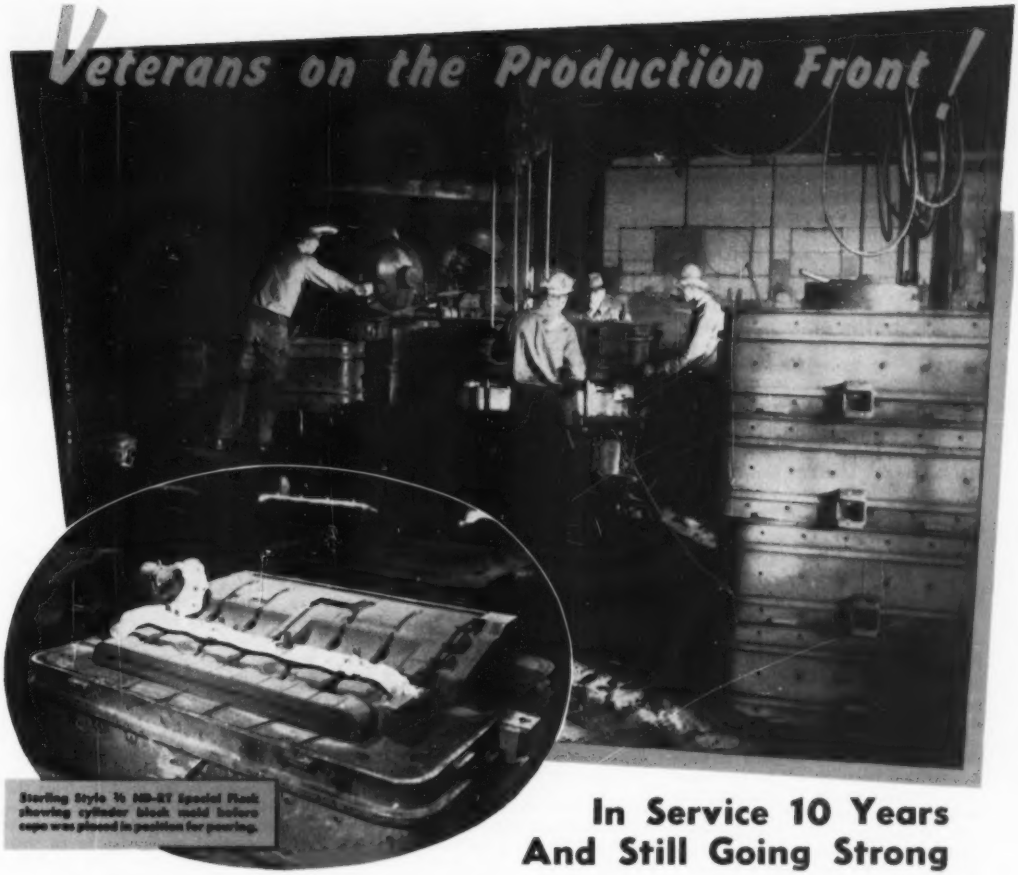
I was particularly amused at the statement "People don't mind working for low pay, even though they feel they are underpaid, if they think that someday they will make it up." If Disturbed Foundryman is underpaid in his present capacity, what makes him think that his company would suddenly begin

▶ Steel casting weighs over 13 tons



Chassis frame for world's largest rubber-tired crane, this one-piece steel casting made by General Steel Castings Corp., weighs more than 13 tons. More than 200 cores are hand set in a shaped pit. Some 58,000 lb of metal is required to fill the mold. Finished product is designed to replace fabricated structures formerly used in automotive type cranes.

Veterans on the Production Front!



Sterling Style 76 HD-ET Special Flask showing cylinder block mold before cope was placed in position for pouring.

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The Sterling Heavy Duty Rolled Steel Flasks, shown above, have been producing cylinder block castings for Diesel engines in a Midwest foundry for more than 10 years. And they are still going strong.

Sterling is the original and only ROLLED STEEL CHANNEL foundry flask. The heavy flanges with square corners and full-width bearing and the solid reinforcing bar around each section provide strength and rigidity to withstand tremendous pressures, year after year. Partings are accurately machined — not just surface ground, but planed to an accuracy of .005". The thick flanges have plenty of steel for several refinishings.

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A-7247-IPC

to over-pay him to "make it up" if and when he becomes a junior executive?

My advice to Disturbed Foundryman would be to take inventory, first of his own company, making a really sound appraisal of what their policies are and what they are actually doing, rather than basing his evaluation on rumor, surmise, or emotional thinking. If things are truly as bad as he implies, then he should probably seek a connection elsewhere.

Then I think Disturbed Foundryman should take a careful inventory of himself and ask himself a few pertinent questions, such as: What have I done, besides work hard (for which I've been paid) to show my company that I am willing to take on more responsibility? What specific and constructive steps have I taken towards becoming a junior executive besides wanting to be one? Is it my company's fault that I have been unable to convince them I have more potential than some college graduate they have never seen before, or have I really tried?

GRAY IRON FOUNDRYMAN

Foundry industry trend

It is not my intention to try to quiet Disturbed Foundryman (Letters to the Editor, October, page 105), but I would like to present some facts regarding the general acceptance of college trainees in the foundry industry.

We must, first of all, recognize that the foundry industry is going through a transition from an art to a science. We have today in the foundry industry industrial engineering, time study, motion economy, work simplification, metallurgy, chemistry, physics, sand metallurgy, chemical engineering, mechanical engineering, electrical engineering, etc. The larger foundries are organizing staff functions as service to line and many of these college trainees are getting into the staff organizations.

I believe most companies going into the college trainee program recognize the advisability of keeping avenues of promotion open to non-college personnel. Our own company has had an apprentice training program for many years and has embarked on a college trainee program. We graduated the first eight college trainees last January 1 and expect to graduate another class of eight next April 1.

PROMOTE FROM WITHIN

In looking at our organization from a functional point of view, we recognize the need of a strengthened central staff organization and we believe that for the most part this has to be serviced by the college man. We still stick strictly to the formula of promotion from within our organization and we believe that in the selection of our college trainees we are getting men of not only adequate educational background but also men of fine character as well.

▶ *Past Director Delahunt dies*

■ E. N. Delahunt, general superintendent of Warden King Ltd., Montrial, Que., for the past 20 years, died November 4 after a short illness. A past national director of the American Foundrymen's Society, he was a member of the organizing committee which developed the Eastern Canada Chapter in 1942. He was a past chairman of that chapter and of the Montreal chapter of the American Society for Metals.

Mr. Delahunt was born in Chester, Pa., and attended Catholic University, Washington, D. C., graduating in 1917 with a bachelor degree in mechanical engineering. He joined the Bureau of Yards & Docks, Navy Department, as junior engineer and served from 1917-19 with the Coast Artillery Corps, U. S. Army. On assuming civilian status he became affiliated with F. R. Weller, consulting engineer. Early in 1920 he was appointed engineer of Crane Company's Bridgeport, (Conn.,) division, then moved to Montreal in 1927 when

E. N. Delahunt

his firm bought Warden King Ltd. He was consulting engineer on construction before his appointment as general superintendent. Mr. Delahunt has been active in Montreal welfare work, especially on behalf of youth.

I do not see that the college trainee program should in any way cause resentment on the part of foundrymen. It should rather contribute to the wholesome growth of the industry.

MAX KUNIANSKY, *Exec. Vice-Pres.*
Lynchburg Foundry Co.
Lynchburg, Va.

Needed for the future

Disturbed Foundryman, who protested the use of college graduates by his company should know that for many years it has been the policy to promote from the ranks within many industries including the foundry industry. Where possible it is still the most used for selection of management and executive personnel.

The foundry industry, however, until the last three or four years has done little except through A.F.S. to promote increased technical knowledge on an industry-wide basis. The need for advanced technological information and techniques has been demonstrated and was brought home to the industry during World War II. Many parts, which were or could have been castings, were converted to other processes. Other industry got the business because, through their technical know-how and advances within their industries, they were able to rapidly expand production and undersell foundries. Each time one of these jobs was lost by the foundry industry it affected the security of everyone working in this industry.

The employment of engineering college graduates by a company can be traced to the desire to improve the company's position in particular and the foundry industry in general. Great strides have been made in the improvement of foundry equipment, methods, and techniques in the past few years but it is certain that we will continue to compete with other industries and must be ready to provide products of top quality at low selling price.

Foundries using college graduates do not intend to cut off promotion of non-college men in the plant. In fact, many companies mix their training programs so that they have about the same number of people in the program from the plant as from the engineering schools. In these cases the college graduate is given practical knowledge to go with his technological background, and the shop man gets a technical background which enhances the practical knowledge he already has. This makes both groups better foundrymen.

TRAIN HIGH SCHOOL GRADUATES

Several companies have also inaugurated programs whereby high school graduates are handled somewhat the same as other trainees except that the training program lasts for a much longer period. In addition all trainees may in many cases take correspondence or extension studies (paid for wholly or in part by the company) to improve their knowledge and understanding.

As we look into the future, we feel certain that the foundry industry as a whole is going to improve much more than it has in the past. Those who aspire to junior executive and executive positions are going to have to be more capable in both the technological and practical aspects of the business. It is not a question of how many years of practical experience is equalled by a college degree, since in the foundry of the future both are going to be vital. To the man who gets into management, a thorough understanding of both may

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MICHIGAN FOUNDRYMAN

Likes college engineers

We have used a number of co-op and Foundry Educational Foundation young men in our organization and we hope to continue the practice. In no case, I believe, have we given greater privilege or salaries to these young men than we have to men with lesser educational background who have shown ability and who are developing in a practical manner.

It has been our experience, with few exceptions, that the students who have worked in our organization have been willing and interested employees and really have added some encouragement, interest, and inspiration—as well as practical training—to some of the older members of our staff.

B. D. CLAFFEY, *President*
Acme Aluminum Alloys Inc.
Dayton, Ohio

Facts of foundry life

The letter from Disturbed Foundryman is a good letter in the fine old American tradition of standing up and "speaking your piece." It concerns a matter which no doubt has caused apprehension on the part of many, which conceivably could be the means of working some injustices, and which although it should be a matter of individual plant policy, probably needs more general clarification.

To begin with, it is probably helpful to recall that business must be operated profitably to survive. To operate profitably, a good, efficient organization is essential. Fundamentally, management is not too much concerned with the formal educational background of the organization, providing that the various groups concerned are capable of operating the plant profitably.

However, management must face the facts of life; management realizes that change is an ever-present reality, that methods, techniques and procedures are becoming increasingly technical, that the need for personnel trained in metallurgy and chemistry, familiar with design and layout, and instructed in sales, accounting and management, is an increasingly serious problem.

It is inconceivable that any foundry management would ignore, overlook, or disregard the accumulated experience of older employees. It is difficult to imagine a short-sighted management policy which would not give opportunity for advancement to any individual irrespective of educational background, providing he has demonstrated his capabilities.

It is a fact, however, attested to by scores of foundry managements, that there is an acute shortage of material both in and out of their organizations, from which to draw for advancement. This arises either because of complacency on the part of many individuals manifested by a lack of disposition on their part to train for advancement, or because of their inability to master the technicalities involved.

It is because of this situation that management has found it advisable to bring into the organization young men with some training and a disposition to progress in the foundry business. These men are intended to augment and to supplement the experience of the older men with their knowledge of modern foundry technology. They are not intended to replace existing personnel and they certainly should be placed on a competitive basis with the rest of the personnel in the plant.

MUST EARN POSITION

No management is under the misconception that the young college man is a ready-made foundryman. Management realizes that long years of training and experience is in store for these men. Each has to prove his right to his position in the organization.

It is the responsibility of management to explain its policy in regard to college trainees to others within the organization. There should be no resentment and no antagonism. Everyone has to work. The fact that a young man has a college degree should not make his quest to earn a living more difficult if he himself applies and proves his ability and capacity.

Management frequently adopts the policy of shifting young men from department to department as a means of aiding them in their selection of the phase of the business which appeals to them most, and also with the objective of affording management a means of measuring or assaying an individual. Individuals within the organization who feel they would benefit from such a training program would certainly receive a respectful hearing from any management.

To sum up, the foundry industry desperately needs aggressive, efficient, capable individuals to insure the profitable continuance of the business. Management would prefer such individuals to come from their own organization. Management, however, has been faced with the fact that there is a definite lack of suitable personnel. Management accordingly is actively supporting programs designed to provide individuals with the technical training and a disposition for foundry careers with the opportunity to acquire practical experience in that field.

OHIO FOUNDRYMAN

Backs stand on engineers

I was pleased to read Hiram Brown's *"Are Technical Graduates Getting Adequate Training in College?"* in the September issue of AMERICAN FOUNDRYMAN. It is apparent that many in engineering education do not realize that the function of the engineering college is to provide the best possible training in the basic principles of engineering and in the humanities.

Cal Tech requires all of its students to carry about 25 per cent of all courses in the humanities. Further, it stimulates activities in literature and art. Funds are provided for a literary magazine, *The Pendulum*, which is written and published entirely by students. Academic credit is not given for this extracurricular activity.

Engineering colleges are not the only ones to whom Mr. Brown's criticism should be directed. Many companies are seeking a graduate trained in specific techniques, and frequently are looking for technicians, not engineers. Misuse of engineers contributes to the present shortage of engineering personnel throughout the industry.

Brown raises the question of high school preparation for engineering college. In many instances, facilities are available for adequate preparation but students are not advised to take the necessary courses. Some high schools cannot give adequate preparation. Engineering schools should weed out students improperly prepared or without aptitude.

HOW TO HELP

What can experienced engineering men in industry do to help the young ones going through college? They can make friends with engineering faculty and students and through this friendship give counsel in education as it is related to industry. Casual counseling is of little value. The student can be shown that the important thing in preparation for a career in engineering is to secure a good grasp of basic principles and to develop facilities in the broad field of humanities, all of which lead to the development of leadership.

Furthermore, experienced engineers can cultivate counselors in junior and senior high schools to give students a better picture of what the engineering profession is like and what preparation is required.

PROF. D. S. CLARK, *Dir. of Placement*
California Institute of Technology

We're technical, informal

Taking the liberty of speaking for my fellow members as well as for myself, I would like to say that AMERICAN FOUNDRYMAN is a top-rate magazine with the rare quality of being technical and yet informal. It is an invaluable supplement to our classroom education as well as a source of interesting diversion. Many thanks and congratulations to you and your crew for AMERICAN FOUNDRYMAN.

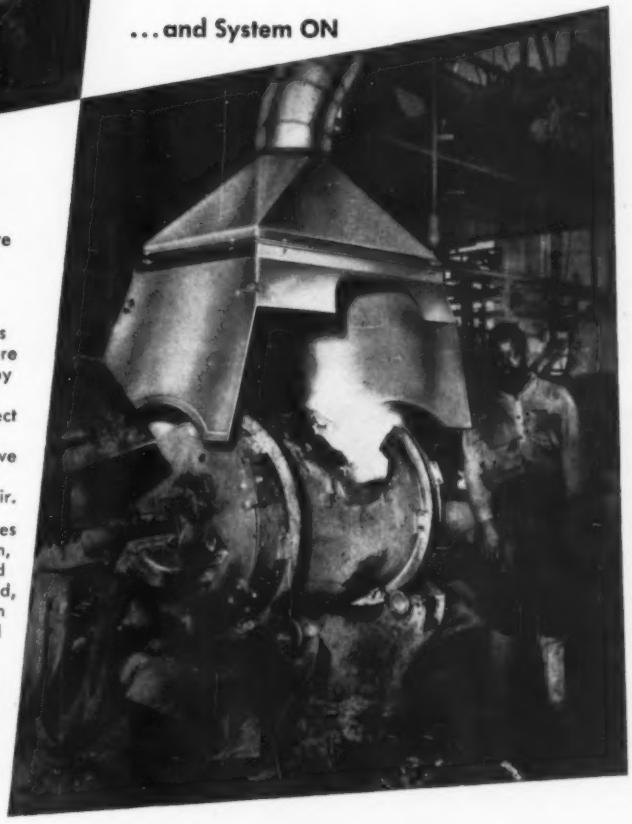
BRUCE L. HARDING, *Corr. Sec.*
Michigan State College
Student Chapter

Results you can see ...in fume control

by KIRK AND BLUM

System OFF

...and System ON



In the plant of The William Powell Company, noted valve manufacturers, six distinct KIRK & BLUM installations control dust and fumes. Shown here are "before" and "after" views in the rotary electric furnace room where bronze is melted.

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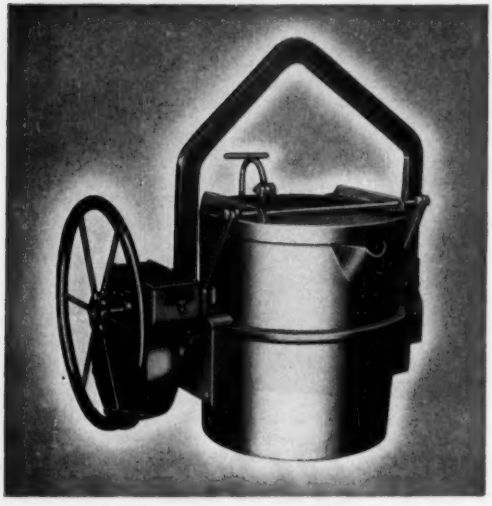
Ladle Headquarters



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Organization dinner, held in Memphis on November 7, saw plans completed for chartering the Mid-South Chapter, latest addition to A.F.S. ranks. Petition, which was approved by the A.F.S. Board of Directors on November 18, bore signatures of 50 prominent foundrymen from southern states.

chapternews

▶ Mid-South Chapter makes debut

Old Man Stork has had a busy time down South—he has just completed the job of delivering the new Mid-South Chapter to the A.F.S. family.

Final arrangements for this happy event were made at a dinner meeting held in the Chisca Hotel, Memphis, Tenn., on Nov. 7. Foundrymen who met on that occasion voted to petition for an A.F.S. charter. Under the direction of a steering committee (see photo below) such a petition was circulated, signed and submitted to Wm. W. Maloney, Secretary-Treasurer of A.F.S. who (along with Albert L. Hunt, A.F.S. National Director) assisted in bringing the new A.F.S. Chapter into being.

Approval of the petition was obtained in something like record time by getting it into the hands of the A.F.S. Board of Directors at a scheduled meeting held in Sea Island, Ga., on Nov. 18.

Here are the names of those who signed the petition: Walter F. Tragarz, Hulon D. Fortune, Jr., Robert McCleskey, F. E. Miller, Jr. B. R. Vowell, E. W. Cartwright, Thomas W. Bant, Raymond Morin, Marion R. Luker, Samuel V. Geer, E. J. Johnson, Charles T. Ellis, D. G. Stevens, A. B. Miller, A. F. Spengler, W. C. Hickerson, Ralph Smith, C. M. Tedington, J. B. Stubblefield, Earl Kreunen, Henry Woodruff, Ernest C. Cartwright, H. E. Tomlinson, W. F. Loar, Charles D. Gray, T. F. Cotten, W. Hughes, B. C. Wilks, C. W. Parker, C. O. Parker, Perry F. Quinn, E. T. Holzer, H. L. Harrington, H. C. Ellis, L. C. Phillips, W. L. Jones, M. B. Parker, M. B. Parker, Jr., J. R. Morris, J. T. Walker, H. T. Hendricks, J. R. Karlovic, Sim A. Levey, J. M. Pittman, Genn Charles, Fred Brown, Jr., M. F. Acklin, Robt. Anderson, W. E. Pace, Carl T. Kemps, A. G. Richardson, Paul Dobbs, M. M. Ruschak, Clarence Rudolph, Marvin Navies, T. Lance.

Twin City Chapter

R. J. MULLIGAN
Archer-Daniels-Midland Co.

"Student Night" was the name given to the Twin-City Chapter meeting on November 11. Some 44 guests attended among whom were selected students and apprentices along with their instructors from the following universities, vocational schools and companies: Hamline University, Macalaster College, St. Thomas College, University of Minnesota, Minneapolis Vocational High School, St. Paul Vocational High School, Dunwoody Industrial Institute and American Hoist & Derrick Co.

Toastmaster R. C. Wood, Minneapolis Electric Steel Castings Co., welcomed the guests and future plans of chapter activities for the students were presented by J. D. Johnson, Archer-Daniels-Midland Co., chairman of the Educational Committee.

Speaker of the evening was George K.

Steering committee of the new Mid-South Chapter which met in final planning session with A. L. Hunt and Wm. W. Maloney—National Director and Sec'y-Treas. of A.F.S. respectively—on November 7, included (back row, from left): E. Johnson, International Harvester Co.; M. B. Parker, M. B. Parker Co.; Walter Tragarz, International Harvester Co.; Charles Gray, Layne & Bowler, Inc.; W. Earl Pace, Memphis Pattern & Model Works; M. B. Parker, Jr., M. B. Parker Co. (Sec'y.-Treas.); and (seated) Henry C. Ellis (Vice-Chairman), Wm. C. Ellis & Sons Iron Works, Inc.; Mr. Hunt; Earl Kreunen (Chairman), Memphis Casting Works, Inc.; Mr. Maloney, and Wm. Parker (Program Chairman), Dixie Foundry Products Co. (all companies named above are located in Memphis). Another committee member, not shown in picture, is Fred Brown, Jr., Arkansas Foundry Co., Little Rock, Ark.

"Are there any questions?" asks John P. Holt, Basic Refractories, Inc., Gary, Ind., as he concludes his speech at the October meeting of the Eastern New York Chapter . . .

—and gets an immediate response from Lyman C. Thunfors, Rensselaer Valve Co., Troy, N. Y., and an attentive listener in J. E. Waugh, General Electric Co., Schenectady.

Dreher, Executive Director of the Foundry Educational Foundation, who emphasized the importance of education in making a man of greater potential value to himself and his employer.

Plans of the chapter's Educational Committee for plant visitations were announced.

The first of these visits was scheduled for the evening of Nov. 25th at the Minneapolis Electric Steel Castings Co.

Tennessee Chapter

PORTER WARNER, JR.
Porter Warner Industries

The October dinner meeting of the Tennessee Chapter attracted approximately 60 guests and members.

Speaker of the evening was William F. Rose, Borden Co., New York, whose subject was "Shell Molding." The lecture was illustrated by a display of shell molds and castings. W. M. Hamilton, Crane Co., Chattanooga, was Chairman of the meeting.

Among the many important facts presented to the group, Mr. Rose pointed out that resin sands for shell molding must be suited to the design or pattern.

For instance, if the pattern design includes sharp angles or deep recesses a resin of high flowing property is needed, whereas designs of mild contour can be made with resins of slower flow. Strength of mold is directly dependent on flowing property of the resin. The greater flow, the stronger the shell. Mr. Rose asserted, however, that mold strength must often be sacrificed in favor of resins of more moderate flow that cure in shorter time.

Mr. Rose also pointed out that some shell cores are being blown by the methanol or wet method of preparing resin coated sand. When the dry mix is blown into the corebox there is a tendency for the sand and resin to separate, but when the wet mix is used the resin film is coated on each sand grain and there is no tendency to separate.

Corn Belt Chapter

VERNON J. HOLMES
Paxton-Mitchell Co.

Members of the Corn Belt Chapter heard Richard Herold, Borden Company, New York, speak on "Shell Molding and Plastic Binders" at their November dinner meeting.

The illustrated speech dealt in considerable detail with such subjects as types of patterns, availability and types of sand used, types of binders, and available machines for shell-mold production.

Considerable interest was displayed by the entire group both in the speech and in Mr. Herold's shell mold display. This interest was especially evidenced by the lengthy question-and-answer session following the address.

Quad-City Chapter

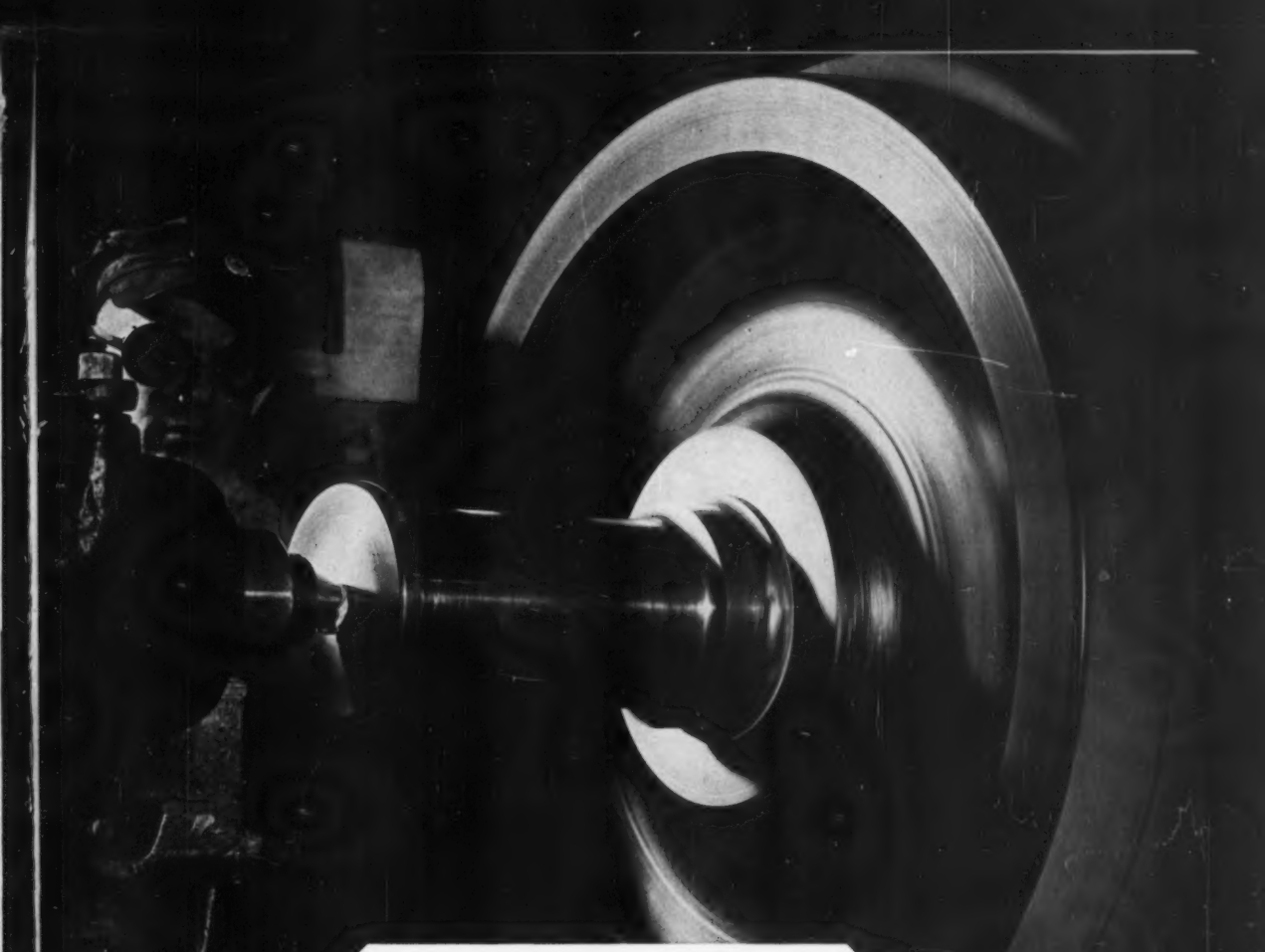
ERIC WELANDER
John Deere Malleable Works

T. E. Eagan, Cooper Bessemer Corp., Grove City, Pa., was the speaker at the November meeting of the Quad-City Chapter. The meeting was held at the Fort Armstrong Hotel in Rock Island, Ill.

The subject of Mr. Eagan's talk was "The Practical Aspect of Nodular Iron." The speech traced the development of nodular iron both in Britain and in this country. Mr. Eagan described the method of producing the material commercially and the physical properties obtainable. Relative position of nodular iron in the family of ferrous metals was also emphasized. The speaker pointed out that it fits in between high strength cast iron and cast steel with regard to properties and uses. He also pointed out that it will augment malleable iron and pearlitic malleable iron

Musical treat for Chicago Chapter's November meeting was supplied by Robert Dalton, U.S. Gypsum Co., one of Chicagoland's more talented vocalists, accompanied by the Chapter's accordianist. Membership Chairman Deming Lucas sits in foreground.

Leaders of non-ferrous, round-table discussion at Chicago Chapter meeting were (from left) William Rudin, Elesco Smelting Co., Chicago; Ernest Henry, Hammond Brass Co., Hammond, Ind., and Chester K. Faunt, Christensen and Olson Co., Chicago.



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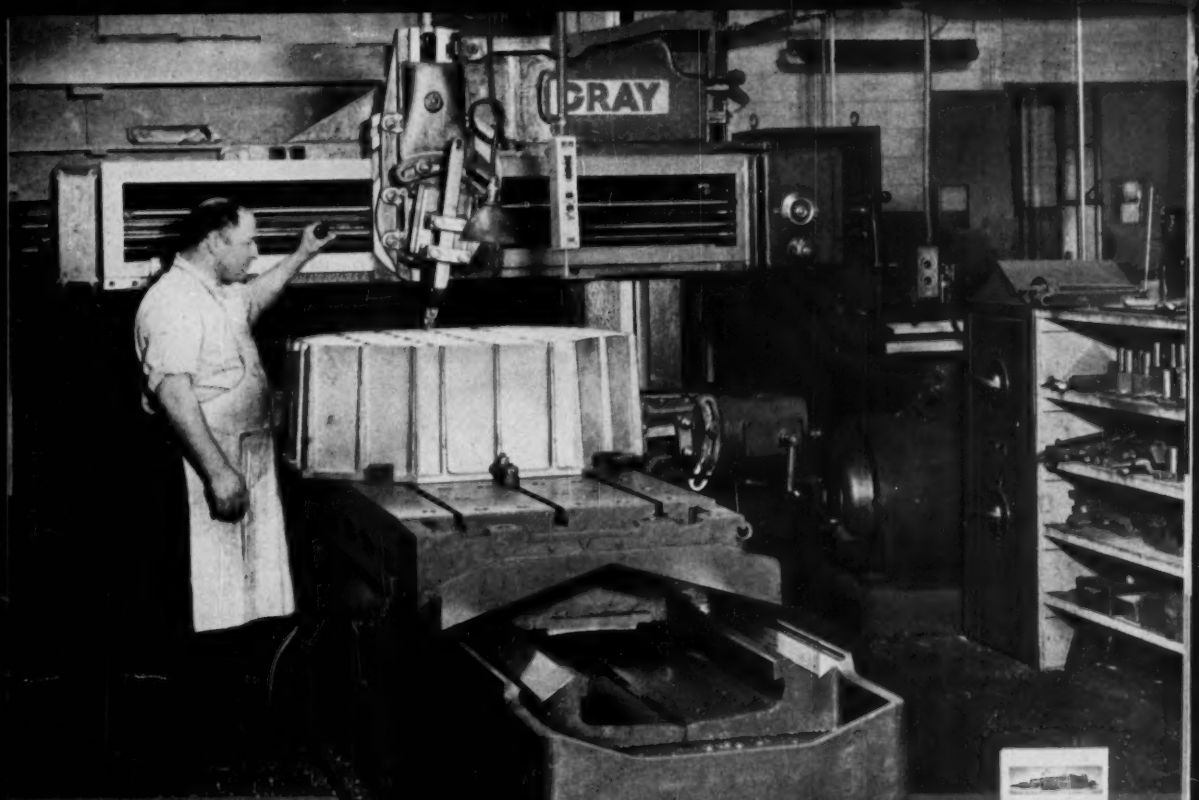

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particularly in heavier sections. He admitted that it is not a "miracle metal" in any respect, but that it does have a very definite place among cast products.

Some of the difficulties of production, in addition to valuable characteristics and uses of nodular were pointed out. A large number of slides were used in illustrating the interesting talk. After his speech, Mr. Eagan answered many questions from the audience and led a highly informative discussion period.

F. T. McGuire, Deere & Co., Moline, Ill. served as Technical Chairman.

Central Ohio Chapter

WILFRED H. WHITE
Jackson Iron & Steel Co.

Central Ohio Chapter's annual meeting in Springfield, held Nov. 10, was attended by an overflow crowd, some arriving from a number of points well out of the Chapter area.

Speaker of the evening was J. S. Schumacher, The Hill & Griffith Co., Cincinnati, who chose as his topic, "Fool-Proof Sand."

Mr. Schumacher's informative talk including a slide-illustrated commentary which explained extensive work being done on a sand which is reputed to be "fool-proof." It is primarily a four-screen sand which assumes a uniform mold hardness after sufficient ramming. This sand is low in cost and has been found desirable for many different sizes of castings. The talk was well received and a lively discussion followed.

Rochester Chapter

HERBERT G. STELLWAGEN
Hetzler Foundries, Inc.

"Foundry Equipment and Dust Control" was the topic discussed at the November 11th meeting of the Rochester Chapter as Ray H. Moore, Claude B. Schneible Co., Detroit, took chapter members on a dual trip through an old style foundry and the same foundry buildings, modernized.

Studebaker foundry was the medium used in illustrating what modern engineering can do to make foundry work easier and more efficient.

Picture slides of the foundry before modernization showed equipment in disorder and buildings clogged with dust and dirt feathers. Modernization changed the picture to one of order and cleanliness. Hand operations were supplanted by push-button controls in the new foundry.

Pig-iron and scrap-metal bins are loaded and emptied by cranes with magnetic lifting devices. Cupola tapping is controlled, pushbutton style, by the crane man who conveys the molten metal to the pouring stations. Shakeout and cleaning are mechanized for a minimum of hand labor.

In addition to the slide-illustrated lecture, the moving picture, "Invisible Shield," was shown. Main point of the color-picture is that heat and dust are important factors in foundry work efficiency. These debilitating elements can be controlled by the use of air—either by compression devices or by controlled circulation. The picture gives an excellent summarization of what can be done.

Western New York

A. J. HEYSEL
E. J. Woodison Co.

Emil A. Piper, Pohlman Foundry Co., Inc., Buffalo, was the speaker at the Nov. 7th meeting of the Western New York Chapter.

"Faulty design is the most common cause of failure of mechanical parts," Mr. Piper asserted. "A foundryman should reject a casting on the drawing board whenever necessary."

Mr. Piper pointed out that designers, in order to prevent mechanical defects, should consult with foundrymen and patternmakers as to general design, type of pattern needed, metal shrinkage, etc.

"Quality and soundness of casting must come before consideration of price," he added. "The question, 'How much per pound?' has warped the foundryman's thinking."

The speaker was introduced by Theodore H. Burke, Worthington Corp., Buffalo, N. Y. Chapter Chairman Carl A. Harmon, Hanna Furnace Corp., Buffalo, presided. Professor Otto V. Guenther, New York State Institute of Applied Arts and Sciences, who is vice-chairman of the education committee, outlined a three-day course in use of industrial sand to be offered at the Buffalo State Technical Institute.

Northeastern Ohio

ROBERT H. HERRMANN AND JACK C. MISKE
Foundry

More than 200 foundrymen and guests assembled for the November meeting of Northeastern Ohio Chapter which featured two technical speakers—Tom E. Barlow, International Minerals & Chemical Corp., Chicago, and Walter Siebert, Cleveland Standard Pattern Works, Cleveland.

After dinner the group saw "A Career in Metals," a sound-slide film produced by the Northwestern Pennsylvania Chapter to stimulate interest of young men and women in foundry work as a career. Earl M. Strick, Erie Malleable Iron Co., Erie, Pa., was present to introduce and present the film, which is designed to be shown to parent-teacher associations, service clubs and young people's organizations.

Mr. Barlow's talk concerned "Casting Defects in Relation to Sand Practice." He discussed fundamental sand tests which range from those performed in the laboratory with elaborate instruments down to those done in the foundry by an experienced man who simply squeezes a handful of sand.

Mr. Sieber, speaking to a separate meeting of the chapter's patternmaking division, discussed "Building Sturdy

At head table for October meeting of Northeastern Ohio Chapter are (left) Guest Speaker John A. Mescher, Unicast Corp., Toledo, and Chapter President Frank C. Cech, Cleveland Trade School, Cleveland.

How to make a speech and enjoy it is demonstrated by H. E. Fellows, Lester B. Knight & Associates, Chicago, as he addresses November meeting of St. Louis Chapter.

Taking it easy following his speech on "Foundry Equipment and Dust Control" at the November meeting of the Rochester Chapter, Ray H. Moore of the Claude B. Schneible Co., Detroit, gets set for the question-and-answer session.

Featured on "Student Night" program of Twin-City Chapter's November meeting were (left to right) Professor Fulton Holtby, University of Minnesota; F. J. Walls, International Nickel Co., Detroit; Guest Speaker George K. Dreher, Executive Director of the Foundry Educational Foundation; and R. C. Wood, Minneapolis Electric Steel Castings Co.

Well-fed trio at Southern California Chapter's dinner meeting in November includes (left to right) Leonard O. Hofstetter, Brumley-Donaldson Co., Los Angeles; Dr. H. K. Salzberg, Borden Co., New York (who spoke to chapter members on "Shell Molding"), and Program Chairman Hubert Chappie, National Supply Co., Torrance, Calif.

Patterns." He stated that patternmakers should know engineering, machine making, molding and casting in order to be able to make effective patterns. In addition, they must take pride in their work. Mr. Siebert emphasized particularly that no pattern should ever be designed without the approval of the foundry which will have to use it. There should, he stressed, be no such thing as a cheap pattern, even for a simple casting.

Southern California

K. F. SHECKLER
Calmo Engineering Co.

A record crowd of over 250 foundrymen and guests attended the November meeting of the Southern California Chapter. Dr. H. K. Salzberg, Borden Company, New York, talked to the group about "Shell Molding."

Using slide projections, Dr. Salzberg illustrated the various types of laboratory equipment used in testing the resin binders required in the shell-molding process. "Dry sand of a fine and clean grade, mixed with dry thermosetting resin powder," Dr. Salzberg explained, "is dropped onto the hot metal pattern or into the hot core box. In a dwell time of a few seconds the sand layer next to the hot metal surfaces hardens for a thickness of from ⅛ to ¼ in. After removal of excess sand the back of the shell still on the pattern or in the core box is subjected to oven heat until thoroughly cured. These molds are assembled and held together by means of staples, glue, tape or bolts. They may be set into a box and backed up with steel shot or other backing material for pouring or if of smaller size, may be poured unsupported."

Dr. Salzberg cited a brochure entitled "How to Evaluate Shell Molding for Your Castings" which may be obtained from Borden's Chemical Division, Foundry Products Division, 350 Madison Avenue, New York 17, N. Y.

Prior to the technical session, Membership Chairman Bruce Farrow, Snyder Foundry Supply Co., Los Angeles, reported that the Chapter has almost reached its quota for the year and urged all members to assist in a membership drive. Plans for the Christmas Party which was to be held at Lakewood Country Club on the evening of December 13, were announced.

Detroit Chapt

WALTER KANTZLER
Kelsey-Hays Wheel Co.

Nearly 100 members and guests attended the November meeting of the Detroit Chapter to hear Edward McFaul, Midwest Institute, Chicago, discuss "What is your Wash Room Rating?". The talk was designed to suggest techniques to be used in the handling of plant personnel relations at the foreman and supervisory level.

Mr. McFaul said that the most important duty of the foreman is to know how to communicate properly with the worker. This involves control of the musculature of the body, words, and deeds. He added that the worker must have confidence in the leader and also deserves recognition from that leader.

Michael Warchol, Atlas Foundry Co., Detroit, was presented the gavel of chairmanship by retiring chairman Vaughn C. Reid, City Pattern and Machine Co., Detroit.

Washington Chapter

HAROLD R. WOLFER
Puget Sound Naval Shipyard

"Smoke Pollution and What It Means for the Northwest Industry" was the subject discussed by Mr. John Rosene, Engineer and Acting Director of Smoke Control for the City of Tacoma, at the October meeting of the Washington Chapter.

Mr. Rosene suggested the following guide lines for foundrymen to consider in their approach to the smoke pollution problem.

"Foundrymen have the best opportunity to cure pollution evils of their industry through their own technical personnel," Mr. Rosene pointed out. "They should get together to create a voluntary pollution abatement committee of their own and openly discuss their problems with other such groups."

The speaker asserted that air pollution is strictly an engineering problem. Only those who have proper knowledge of it should serve on such air abatement committee. The dinner meeting, a smorgasbord affair, was held at the "Top-O-The-Ocean" restaurant in Tacoma.

St. Louis District

FRED J. BOENEKER
Bronze Alloys Co.

"Past Chairmen's Night" was celebrated at the November 13th meeting of the St. Louis District Chapter. In the absence of Chairman Henry W. Meyer, General Steel Castings Corp., Lindenwood, Mo., who was attending the Southwest Regional Conference in Dallas, the meeting was presided over by Vice-Chairman Webb L. Kammerer, Midvale Mining & Mfg. Co., St. Louis. Mr. Kammerer gave a very interesting history of the St. Louis Chapter since its inception, giving special credit for the work performed by the past chairmen. Special A.F.S. membership pins were presented by Mr. Kammerer to each past chairman present.

Technical chairman of the meeting was W. C. Pickles, American Brake Shoe, St. Louis, who introduced H. E. Fellows, Lester B. Knight & Associates, guest speaker of the evening. Mr. Fellows had recently spent several months in Europe with the Mutual Security Agency. His work there was the organization of modern foundry practices and the equipping and modernizing of foundries. Mr. Fellows spoke on the subject "Foundry Modernization." "Most foundrymen think that modernization means mechanization," he stated "but this is not always the case."

"Modernization should be accom-

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plished with a minimum of mechanization. A modern foundry is one where there is maximum production with a minimum of man-hours of effort under ideal working conditions. The amount of mechanization required to accomplish this must be economically justified.

"There are many hand-operated foundries today producing castings at low cost but under very poor working conditions. These foundries must be modernized to reduce effort and to improve working conditions,—but without increasing the cost of production. There are also some foundries in operation today which are mechanized to the highest degree but at a staggering cost. These must be re-engineered, from en economic standpoint.

Mr. Fellows described by specific examples the advantages of overall rather than piecemeal planning, and gave various instances of procedural changes made by various foundries, both here and abroad, which reduced costs and improved profits. He further emphasized the fact that a complete study of foundry lay-out was necessary to a modernizing program which would produce the desired results with a minimum of mechanization.

The meeting was attended by 130 chapter members and friends.

N.W. Pennsylvania

ROY LODER
Erie Malleable Iron Co.

The October meeting of the Northwestern Pennsylvania Chapter was designated as National Officers Night. More than 100 members and guests attended the dinner meeting, some coming from as far as Butler and Grove City.

Fred Carlson, Weil-McClain Co., Erie, announced a forthcoming joint meeting with the Materials Handling Society and introduced Earl Strick, Erie Malleable Iron Co., who spoke briefly on educational activities.

Mr. Strick in turn introduced I. R. Wagner, Electric Steel Casting Co., Indianapolis, National President of A.F.S., whose home originally was in the Keystone State.

Mr. Wagner congratulated the membership on the fine work being done along the educational lines, commenting upon the large number of young men present.

Mr. Wagner then spoke of the successful convention at Atlantic City under Past President Walter Seelbach, Forest City Foundry, Cleveland, and outlined plans for next year's convention to be held in Chicago in May.

Mr. Seelbach was presented to the group. He spoke briefly of the great growth of the American Foundrymen's Society and the fine work it was doing for both the workers and management.

Wm. W. Maloney, A.F.S. Secretary-Treasurer, was then introduced to the group. He commended Mr. Strick on his work with the Educational Committee and spoke highly of the chapter's latest educational venture, "A Career in Metals".

Chief address of the evening was presented by S. C. Massari, Technical Director of A.F.S. He spoke briefly on the achievements of his committee in work on the molding manual and described to some extent the work that had been done to produce the picture he was about to show entitled "The Flow of Metal in the Mold."

The picture proved one of the most interesting presentations ever made to the chapter. The film, narrated by Mr. Massari, described the different methods of down sprue and runner bars and basins. Its theory, shown with plastic molds and water, actually has been proved with metal and sand molds.

Addressing members of the Texas Chapter's Houston section, John G. Collier, Garrett Brass & Machine Co., Houston, calls October meeting to order in the activities room of Cleco Division, Reed Roller Bit Co. Photo was snapped by a Cleco employee.

"Past Chairmen's Night" at the November meeting of the St. Louis District Chapter brought out the following past chairmen (clockwise from left): Roland T. Leisk, American Steel Foundries, East Chicago, Ind.; Walter Illig, Banner Iron Works, St. Louis; Carl Marken, Kennedy Valve Mfg. Co., Elmira, N. Y.; C. R. Culling, Carondelet Foundry Co., St. Louis; Geo. Shepard (now a cattleman), Clarksville, Mo.; Ralph Hill, East St. Louis Castings Co., E. St. Louis, Ill.; and (all of St. Louis) Roy Jacobsen, Carondelet Foundry Co.; N. L. Peukert, Carondelet Foundry Co.; A. L. Hunt, American Brake Shoe Co.; and Geo. W. Mitsch, American Car & Foundry Co.

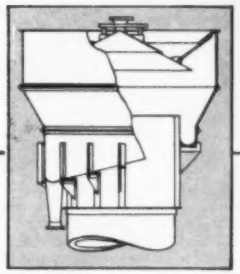
Metropolitan Chapter

ANDREW DEVLIN
Daniel Goff Company

An unusually large number of foundrymen and suppliers in the Metropolitan area attended the first meeting of the 1952-1953 season at the Essex House on October 6, 1952. The subject selected for this first meeting, "Resin Core Binders," was discussed by Richard Herold, The Borden Co., New York.

Despite early non-acceptance of plastic core binders, Mr. Herold pointed out that their use has become widespread in the past several years. In outline, he attributed this growing replacement of oil binders to the following advantages of synthetic resin binders:

Lower over-all core costs; greatly reduced baking time which means greater oven capacity, lower fuel costs, and lower investment in dryers; better core physicals; smoother core surface requiring less finish-machining of castings; no volatiles to gum up interior of ovens and contaminate surrounding worker area; less gas; better collapsi-



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In a huddle at November meeting of Central Illinois Chapter (from left) A. A. Hilbron, A.F.S. Convention Chairman; J. Kauzlarich and H. Felton, both of Peoria Malleable Castings Co., Peoria, Ill., talk over a point with Guest Speaker G. A. Peeler, General Electric Co., Elmira, N. Y.

bility; better shakeout; high strength in warm cores; and cured binder, being moisture-resistant, doesn't draw dampness.

Technical Chairman for the meeting was Clinton F. Zabriskie, Sperry Gyroscope Co., Lake Success, N. Y.

Mokan Chapter

T. F. SHADWICK
Witte Engine Works, U. S. Steel Co.

Among the members and guests attending the November dinner meeting of Mokan Chapter was Clarence W. Culbertson, Great Lakes Carbon Corporation, St. Louis. Formerly a resident of Kansas City, Mr. Culbertson was a charter member of Mokan, and one of the persons most instrumental in establishing the Chapter. Other guests representing some 15 different companies and corporations also contributed to the interest and success of the meeting.

The subject of "Shell Molding" was well presented in the educational session by Guest Speaker Richard Herold, The Borden Co., New York. Mr. Herold said that many who desire to get into shell molding are skeptical not because of its results but because of costs. Many foundries have experimented with shell molding and help is available to those who are interested and wish to try the process. Those companies which have developed the process along conservative lines have shown a profit.

Other organizations

New England

MYRON DE HOLLANDER
General Electric Company

The New England Foundrymen's Association met on November 12th as guests of the A.F.S. Student Chapter at the Massachusetts Institute of Technology. Some 125 association members enjoyed the catered roast beef dinner which was served in the new foundry laboratory.

Professor Melvin Adams of the M.I.T. Laboratory explained to the group the many activities, both educational and research, that are being carried on in the interest of foundries at M.I.T. It was stated that about half of their work was of an educational nature and half research.

In closing his address, Professor Adams expressed the appreciation of the Laboratory to the industries and individuals who have been responsible for making available most of the M.I.T. foundry laboratory equipment which includes small cupolas, sand-slinger, molding machines, an electric arc furnace, facilities for induction melting, sand mixing equipment and shakeout in addition to the necessary run-of-the-mill foundry equipment.

Reading

W. I. CASSIDY
Secretary

How effective material handling can reduce foundry costs was the subject chosen by William Morley, Link-Belt Company, Philadelphia, for his speech before the Association's November meeting. (Editor's note: Mr. Morley authored the paper on "Mechanization of a Small Foundry" which was presented in the November issue of AMERICAN FOUNDRYMAN.) "Careful planning toward the effective handling of material will have a drastic effect on the cost of the castings produced," Mr. Morley asserted.

Safety research indicates that 31 per cent of industrial accidents result from mishandling of materials.

Even building costs, he added, can be saved or reduced by proper storing and installation of modern material handling devices. Morley illustrated his talk with slide films and charts. The meeting was attended by 100 members and guests.

Chow time at the Western Michigan Chapter's November meeting found this lineup at the speaker's table (from left): Fred J. DeHudy, Centrifugal Foundry Co., and William J. Cannon, Jr., Nugent Sand Co., both of Muskegon, Mich.; A.F.S. Vice-President and National Director Collins L. Carter; A.F.S. Secretary-Treasurer Wm. W. Maloney and A.F.S. Technical Director S. C. Massari; John VanHaver, Sealed Power Corp.; George W. Bartlett, Lakey Foundry Corp.; and Donald Mavis, West Michigan Steel (all of Muskegon).

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Magnesium has twice the tensile strength of aluminum.

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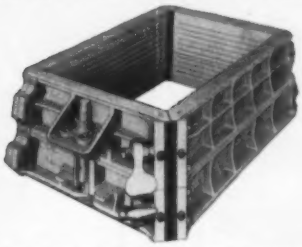

Long-life, easily replaceable, live rubber corner inserts completely close the corner gaps so that no sand can lodge in the open corners.

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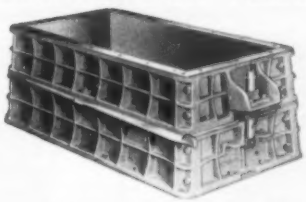

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FREMONT CAST IRON OR CAST ALUMINUM JACKETS

Save You Real Money!

Precision machined and drilled, bolted corner construction permits easy insertion of new sides or ends. The entire jacket need not be scrapped. Standard style for ordinary foundry practice. Grooved style, which permits ready gas escape, for steel foundries. Glass and jackets can be assembled on 3°, 4°, or 5° taper.

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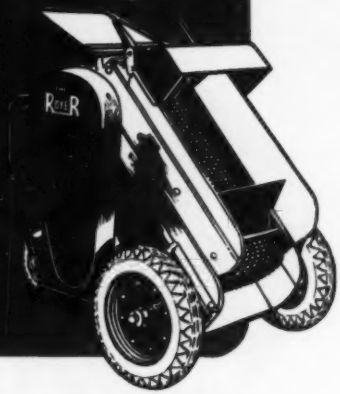

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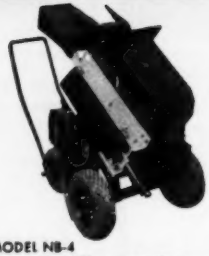
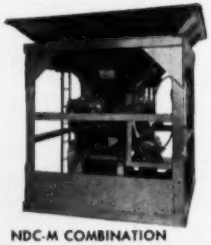


MODEL NB-4
7 to 9½ tons per hour

MODEL NC-2
12 to 15 tons per hour

MODEL NDP
20 to 25 tons per hour

MODEL NYS
60 to 100 tons per hour



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... use Royer Sand Preparation equipment. Whatever your capacity needs may be, a Royer or combination of Royers can supply the demand, quickly and economically. From 4 to 100 tons of molding sand per hour, depending on the model, can be prepared at one-half the cost of manual conditioning. This operating economy is only part of the savings you make. Because of the proper conditioning of your molding sand you will have fewer rejects due to blows and run-outs and the smoother surfaces will reduce cleaning and grinding time.

All models from the small Junior (4 to 7 tons per hour) to the NYS (60 to 100 tons) give you the six point conditioning—thorough refuse removal; positive lump breaking; complete blending and mixing; even distribution of moisture; increased permeability; double aeration. The finished product is an open, velvety textured sand—ready for the molder's use.

More than 8000 Royers are in use today in foundries everywhere—large and small—jobbing or production—preparing properly conditioned sand for true-to-pattern molding.

Investigate the possibilities for these cost-cutting machines in your plant. Our Bulletin 744, sent on request, gives complete information on sizes and models available.

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abstracts

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Nodular graphite production

A250 . . "Researches in Nodular Cast Iron," A. L. De Sy, *La Fonderie Belge*, No. 8, August 1952, pp. 148-170. (In French)

This is a detailed report of the findings in research on nodular cast iron. The production of nodular graphite structures in cast iron is treated from the standpoint of conditioning factors as well as processes. The author asserts that desulphurization, stabilization of carbide, and ease of solubility are not absolutely necessary conditions for the spherulitic crystallization of the graphite. Considerable emphasis is placed upon the influence of decomposition of the eutectic cementite at solidification. The author compares the progress and findings of Belgian researchers with those of their United States colleagues.

Cast cutting tools

A251 . . "Applications and Advantages of Cast-Alloy Cutting Tools," C. M. Adams, *Tool Engineer*, Vol. 29, No. 4, October 1952, pp. 37-39, 47.

Three types of tool materials are needed: high-speed steel, cemented carbides, and cast alloy. All three types are discussed with respect to their properties and applications. However, the greatest emphasis is on the advantages of cast alloys for many applications. True cast alloy tool applications are those which call for medium speeds with medium to heavy feeds or deep cuts, or both. These tools perform efficiently on practically all cutting operations, and can be used on very hard stock.

Spheroidal graphite iron

A252 . . "Mechanical Properties and Applications of Spheroidal Graphite Iron," A. B. Everest, *Fonderia*, No. 9, September 1952, pp. 318-332 (In Italian)

This article analyzes the various characteristics and uses of spheroidal graphite cast irons. Typical applications are cited. The author describes in detail the production of nodular graphite structures in cast iron. The article refers also to the results of notched and unnotched fatigue tests on flake and nodular cast irons. The influence of silicon content on mechanical and high temperature properties of nodular cast iron, specifications for nodular iron castings, the annealing and the heat treatment of nodular and other cast irons receive detailed treatment and are adequately illustrated.

Patternmaking

A253 . . "Construction of Patterns and Designs of Castings," F. Fisher, *Giesserei*, Vol. 39, No. 17, August 21, 1952, pp. 411-416. (In German)

In the cases where single-part production is involved, wood is used to make patterns. In mass production with molding machines, especially when the casting is thin, metal patterns are preferred. The designing and making of patterns requires competence and skill. It requires a good background in chemistry of metals, wood and metal machining, forging, etc. The latter part of the article is devoted to the various problems involved in the designing of castings.

Combined carbon analysis

A254 . . "Determination of Combined Carbon in Graphitic Iron," *Journal of the Iron and Steel Institute*, Vol. 172, No. 9, September 1952, pp. 79-86.

Methods of determining combined carbon in graphitic iron have been examined. The derivation of the combined carbon by difference following separate determinations of total and graphitic iron is preferred as a standard procedure rather than the direct procedures which were investigated. The use of solid samples for both total and graphitic carbon is recommended, as drillings tend to give low results due to the loss of graphite as a fine dust. The difficulties in sampling are emphasized, and the use of a hollow mill to prepare solid specimens is proposed.

Spraying cupola lining

A255 . . "The Application of the Spraying Method in the Relining of Burnouts in the Cupola," Kurt Krämer and Otto Reinsberg, *Giesserei*, Vol. 39, No. 15, July 24, 1952, pp. 357-362. (In German)

The authors discuss the various methods used formerly to mend burnouts in cupola furnaces. Prolonged experimentation has demonstrated that the spraying method affords a speedier and more reliable placing of the material with low water content upon the affected spot in the cupola furnace. Any contour can be assumed. Contrary to the case of hand-applied relining material, a small portion of clay is required. The spraying method, furthermore, is less costly.

Using high-ash coke

A256 . . "Cupola Coke," A. G. L. Lewis, *Engineer and Foundryman*, Vol. 17, No. 1, May 1952, pp. 87, 89, 91, 93.

Foundrymen in Southern Africa must modify their techniques since the coke which they use contains more than 15 per cent ash. The ash content of the coke may be reduced by washing and flotation prior to coking, but these operations are very expensive. Melting conditions must be controlled precisely or the iron will be very low in carbon, causing difficulties in casting and machining of the castings produced. Silicon additions are insufficient to remedy the machinability. The disadvantages of using high ash coke may be overcome by (1) proper cupola design, (2) using a low ash pitch coke to offset the high ash coke, or (3) melting in reverberatory furnaces fired with powdered coal.

Mist of wet water (produced by chemical reduction of surface tension) is sprayed over open shakeout area in a Wisconsin foundry. Spray nozzles and tank are mounted on shakeout crane. For detailed account of this and other methods of dust control, see article on page 53.

shop talk

continued from page 66

data concerning ferromanganese ladle additions. Specifically, how many points of manganese are considered a relatively large adjustment? What constituents in the base iron help and hinder this gas formation? Does the gas formed adversely affect the iron because of its quantity, because it does not readily escape, etc.?

In some instances, gas defects have been encountered when relatively heavy additions of high-carbon ferromanganese were made to ladles of cast iron. These additions were in the general order of 0.35 to 0.75 per cent manganese. While in all probability metal composition plays a part, the use of medium-carbon or low-carbon ferromanganese seems helpful in reducing the tendency toward gas formation.

▶ Linseed oil specifications

What are the approved specifications on raw linseed oil for use in core oils?

There is no approved specification. The foundry industry evaluates core oil in terms of its ability to produce an acceptable core at a minimum cost, not in terms of its chemical composition or physical properties. Although indirect in one sense, it is a direct evaluaton from an economic standpoint. One way to do it was described by R. H. Olmsted, Whitehead Bros., New York, in the June 1950 issue of AMERICAN FOUNDRYMAN (page 58). He evaluated a dozen oils in the basis of oil cost per pound of baked shear strength and other tests.

The A.F.S. *Foundry Sand Handbook* outlines the method of determining the strength of coresand mixtures made with dry or liquid binders, using either the A.F.S. Standard Sand or the Secondary Standard Sand.

▶ Silica sand rating

Is silica sand with an A.F.S. designation of 5D a molding sand or a core sand?

The 5D rating is an old classification from the 1938 edition of the A.F.S. *Sand Handbook*. Class 5 covers sands with A.F.S. grain fineness numbers 50 to but not including 70. Classification D covers sand having clay content five per cent minimum, ten per cent maximum. The rating would usually mean a molding sand.

▶ Avoiding high rejection rate

The rejection rate on our own non-ferrous castings runs to 20 per cent, and on purchased ferrous castings to 60 per cent. Often rejection takes place only after considerable machining has been done. Please advise us what methods are being employed to check such castings prior to machining.

For pilot runs to establish techniques for production of sound castings, sectioning in suspected areas can be done or the castings can be radiographed for detailed inspection.

With very critical end use of castings, the purchaser frequently requires radiograph examination of all castings, which substantially increases the cost, both through higher reject percentage and the actual cost of the radiography. But in most instances, establishment of proper techniques through proper examination of pilot castings will cut down markedly the percentage of rejects and result in substantial economies.

With ferrous castings, the use of periodic magnetic powder inspection proves advantageous, but frequently will not disclose deep-seated defects. Radiographic and magnetic powder inspection services are available through laboratories and consultants.

▶ Rammed up and poured

Mechanization

Pull a lever, push a pedal,
and you have a core.
Pull a lever, push a pedal—
there, you have some more.
Pull a lever, press a button and
you have your sand.
Throw a switch and press a trigger,
and your mold is rammed.

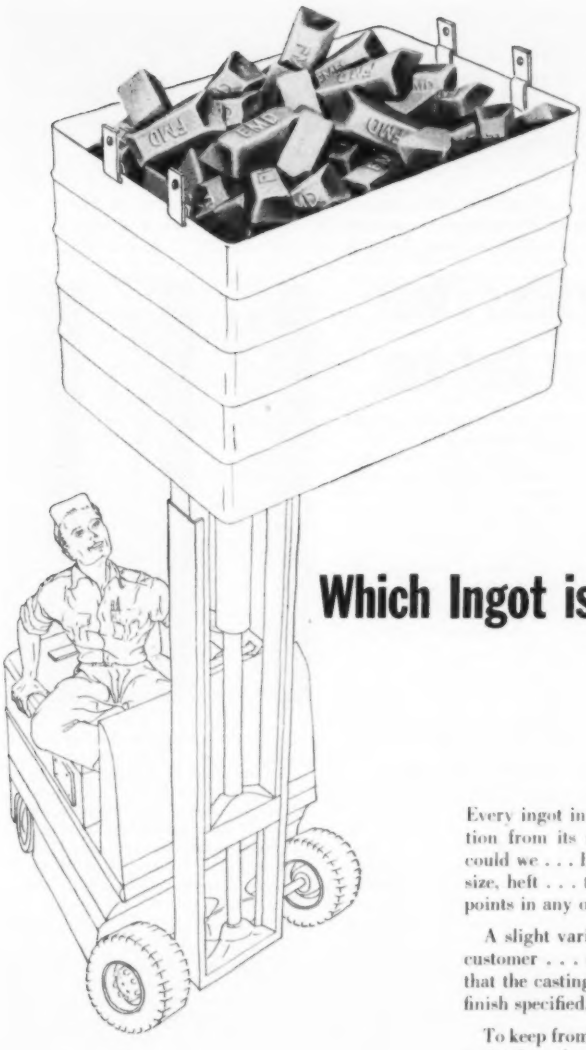
Drop a nickel, push a button when
you buy a coke.
Deposit coins and pull a handle if
you want a smoke.
Washing dishes, driving autos—
always just the same,
Flashing lights and bells and buzzers
on the pinball game.

Whining of cranes, clashing of gears
Beat in your brain and ring in your
ears.
Hissing and clanking all day, and
it seems
The noises go on all night in your
dreams.
Machines and gadgets, day and night
Keep me in a nervous fright.
For one thing I've arrived at
There are no "ands" and "buts."
It's science and invention
That's driving mankind nuts.

Some day I think I'll get a job
In some old fashioned beanery
Where people go to eat—and work
Without so much machinery.

Copyrighted by Electric Steel Foundry Co.

Bill Walkins, Electric Steel Foundry Co., author of *Rammed Up and Poured*, presents an autographed copy to A.F.S. National Vice President Collins L. Carter, at Northwest Regional Conference. Photo by Norman E. Hall, Electric Steel Castings Co.



Which Ingot is Best for You?

Every ingot in that stack might be slightly different in composition from its neighbor. You could never tell . . . and neither could we . . . by simply looking at the lot. Color, texture, shape, size, heft . . . they would all seem alike, but might vary several points in any one of the elements.

A slight variation of ingredients could lose you an important customer . . . strain relations at the very least, when he found that the castings did not "turn up right" or "refused to take the finish specified."

To keep from losing customers . . . yours and ours . . . Federated maintains the most exacting scientific metallurgical control known in the business. You can be sure of the composition . . . to within infinitesimal fractions of a percent . . . when you use Federated products.

In these days of variable labor and material markets it pays to buy a known, trustworthy metal. Take advantage of Federated reliability and service. A call to our nearest plant or sales office, or a card to our main offices, 120 Broadway, New York 5, will bring quick help on any metal problem.

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ELECTROMET Data Sheet

A Digest of the Production, Properties, and Uses of Steels and Other Metals

Published by Electro Metallurgical Company, a Division of Union Carbide and Carbon Corporation, 30 East 42nd Street, New York 17, N. Y. • In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

New Foundry Alloy Neutralizes Effect Of Varying Section in Gray Cast Iron

Low-Carbon Foundry Ferrochrome is a new silicon-chromium alloy specially developed by ELECTROMET for the alloying of cast iron. It is so balanced in composition that it increases the strength and Brinell hardness of gray iron, as well as its resistance to wear and corrosion, without increasing the chilling tendency of the metal.

The alloy has a nominal analysis of 50 per cent chromium and 30 per cent silicon. It has excellent solubility in iron, and the inoculating effect of the silicon content makes it possible to add up to 1 per cent chromium to gray iron as a ladle addition, with no appreciable increase in chill depth. Light-section castings, such as automobile and truck exhaust manifolds and stove parts, may easily be produced in 1 per cent chromium iron by a simple ladle addition of the alloy to any base iron that would be suitable for casting the same parts in unalloyed iron.

Effect on Chill Depth

Fig. 1 illustrates how chill depth was affected by varying additions of the new alloy to a commercial cupola iron analyzing 3.24 per cent carbon and 2.12 per cent silicon, with 0.12 per cent residual chromium. A chill depth of approximately ¼ of an inch was obtained in all of these typical hatchet-type chill-test specimens.

Effect on Mechanical Properties

Although Low-Carbon Foundry Ferrochrome was especially developed for decreasing the section sensitivity of gray iron castings, it is also useful in obtaining moderate increases in the strength of gray iron, when used alone or in combination with the alloys nickel, molybdenum, or vanadium. An unalloyed base iron, analyzing 3.43 per cent carbon and 1.95 per cent silicon, was treated with additions of 0.36 per cent and 0.84 per cent chromium. The following table gives the complete analyses of the irons. It shows how both Brinell hardness and tensile strength were improved by the alloying additions.

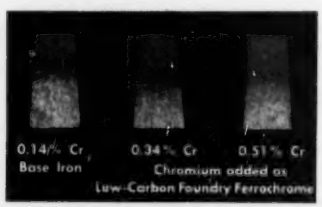

Fig. 1. These fractures of broken chill specimens show the effect on chill of chromium additions made with Low-Carbon Foundry Ferrochrome.

Analyses	Brinell Hardness	Tensile Strength
3.43 % total carbon, 1.95% Si, 0.05% Cr.	202	31,000
3.41% total carbon, 2.20% Si, 0.36% Cr.	217	35,400
3.32% total carbon, 2.56% Si, 0.84% Cr.	228	36,100

Auto Cylinder Castings

Addition of chromium to cast iron in the form of Low-Carbon Foundry Ferrochrome tends to stabilize the pearlitic structure of the iron, and to eliminate areas of soft secondary ferrite in slowly cooled sections. Moreover, the alloy helps avoid difficulties with chilled corners or edges in thin sections. It is therefore particularly well suited for producing a cylinder-type iron with consistently good structure and improved uniformity of hardness in sections exposed to widely varying cooling rates.

An example of the usefulness of this alloy is illustrated in Fig. 2, which shows strips cut from the bores of three automotive cylinder blocks. The base iron used in these castings was a typical unalloyed cylinder grade of cast iron, analyzing 3.38 per cent total carbon, 2.07 per cent silicon, and 0.08 per cent residual chromium.

The design of these castings was such that a heavy boss close to the cylinder bore caused slow cooling along one side, resulting in a soft area and wide variation in hardness along the length and around the perimeter of the unalloyed cylinder.

The strips illustrated in Fig. 2 were cut from the soft side of the cylinder bore. When subjected to a Rockwell B hardness exploration, casting No. 1 showed a variation in hardness from 92.2 to 80.2 Rockwell B (196 to 150 Brinell*). Casting No. 2 showed a variation from 94.0 to 90.8 Rockwell B (205 to 189 Brinell). Casting No. 3 showed a variation from 95.5 to 90.3 Rockwell B (213 to 187 Brinell).

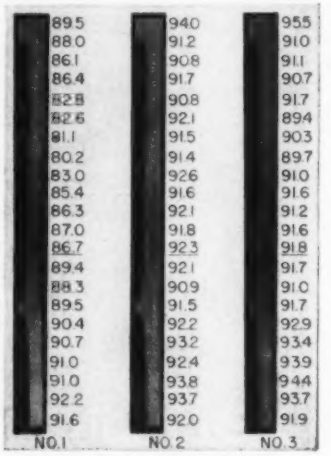

Fig. 2. Average Rockwell B hardness values at indicated positions in strip specimens from the bores of three cylinder block castings. No. 1-Untreated base iron containing 0.08% chromium. No. 2-Treated with 0.31% chromium added as Low-Carbon Foundry Ferrochrome. No. 3-Treated with 0.44% chromium added as Low-Carbon Foundry Ferrochrome.

The small chromium additions made in cylinders Nos. 2 and 3 had a marked effect in reducing the hardness spread and also in stabilizing the desired pearlitic structure in critical areas of the cylinder bore. This provided satisfactory resistance to wear in spite of difficulties introduced by an admittedly difficult design. Similar problems exist in most iron foundries—problems that Low-Carbon Foundry Ferrochrome can help solve with a minimum change in melting practice and at a very reasonable cost.

Booklets Available

Further information about this new ferrochrome is given in the booklets, "New Chromium Alloy Neutralizes Effect of Varying Cooling Rate in Gray Iron" and "Silicon-Chromium Alloy in Complicated Iron Castings." You may obtain copies, free of charge, by writing or phoning to the nearest ELECTROMET office: in Birmingham, Chicago, Cleveland, Detroit, Los Angeles, New York, Pittsburgh, or San Francisco. In Canada: Welland, Ontario.

*All Brinell hardness values were obtained by conversion from Rockwell B.

The term "Electromet" is a registered trade-mark of Union Carbide and Carbon Corporation.

foundry tradenews

Acquiring helpful ideas about iron and steel is the goal of a five-weeks' study recently undertaken by a group of management and technical experts representing the Yugoslav iron and steel industry. The experts visited foundries, open-hearth, blast, and electric-furnace steel mills as part of the Mutual Security Agency's technical assistance program.

Brooks Foundry, Inc. has been adopted as the new corporate name of the firm heretofore known as Brooks Furnace Co., Albion, Mich.

Dow Corning Corp., Midland, Mich., uses a traveling display of some 20,000 lb of equipment, parts, and assemblies to exhibit to businessmen and engineers the physical properties and multiple uses of silicones in industrial and military activities. Among foundry uses of the silicones, developed and produced by Dow Corning, are parting compounds, release agents, and lubricants. Silicones are described as capable of withstanding moisture, voltages, extreme temperatures, and other conditions.

Majac Engineering Co., Blawnox, Pa., recently opened new offices at 189 Freeport Road. The company manufactures jet pulverizers.

Worthington Pump & Machinery Corp., Harrison, N. J., is installing an electric-arc furnace and a new charging system in its steel foundry to handle larger sizes and varieties of iron and steel scrap. The furnace, of two-ton-per-hour capacity, was purchased from Pittsburgh Lectromelt Furnace Corp. It features a swing-aside roof that is raised and pivoted for rapid top charging. Controls maintain a uniform high rate of melting through the use of rotary regulators. The new furnace can be used with an existing high-frequency induction furnace in duplexing operations. Because of loads and surges imposed on power lines by the new equipment, a 26,000-volt power substation is being installed to replace one now supplying 4,160 volts.

Aluminum Import Corp., distributing agency in the Western Hemisphere for the Aluminum Ltd. companies, opened its mid-western office in Chicago November 3. Branch sales manager in charge of the midwest office is George R. Malby. Aluminum Ltd. is the parent company of Alcan, the Aluminum Co. of Canada, one of the principal suppliers of aluminum to the U. S. market.

Cleco Division of Reed Roller Bit Co., Houston, Texas, has opened a sales and service office and warehouse at 18071 Wyoming Ave., Detroit, Mich. The company also has appointed the following distributors for its products: Electric Tool & Supply Co., Los Angeles, Cal.; Industrial Supplies Co., Steubenville, Ohio; and Florida Aviation Corp., Miami. Cleco manufactures the Cleco and Dallett lines of air tools and accessories, for use in foundries and other manufacturing plants.

Lynchburg Foundry Co., Lynchburg, Va., is adding over $800,000 worth of equipment, to be housed in existing buildings, for the production of small and medium castings by shell molding. When the installation is completed in some six months, Lynchburg will have the first large shell molding department in the merchant foundry field, according to Max Kuniansky, executive vice-president. The new facilities are designed for three-shift operation.

The Metal Dealers Div., National Association of Waste Material Dealers, Inc., N. Y., recently passed a resolution directed to OPS calling for suspension of all price controls on non-ferrous scrap metals. Reasons alleged for such suspension were that the regulations now are unnecessary, discriminatory, and otherwise inequitable.

Tin, Lead, and Zinc Div. of N.P.A. now is combined with the Miscellaneous Metals and Minerals Division. Erwin Vogelsang is director; Harry Sharpe is deputy director. NPA has amended order M-11 (copper and copper-base alloys) to permit copper-controlled materials producers (foundries) to obtain supplies of other materials, such as steel and aluminum, by self-certification without filing separate applications with NPA for these materials. The amendment provides that foundries may use the allotment symbol PM in the self-certification procedure without filing CMP 4B applications to obtain minimum quantities of other production materials during any calendar quarter.

Aluminum Co. of Canada, Ltd., has arranged to double the amounts of aluminum shipments to U. S. consumer plants during the first quarter of 1953. Distribution will be arranged according to government allocation controls. The increased amounts allocated to U. S. needs are obtained by expansion of the company's producing facilities and by postponing delivery of part of the metal scheduled for the United Kingdom.

Shell molds used for low-cost production of high-quality stainless-alloy castings by Solar Aircraft Co., San Diego, Cal. Solar believes the molds, made of a mixture of sand and thermosetting plastic, superior to green-sand and baked-sand molds they ordinarily use.

Molten stainless steel being poured into shell molds at Solar. According to this company, the advantages of the shell-molding method include better surface finish, better dimensional control—which may eliminate machining—and lower costs by reducing operations.

These Products are *LEADERS* in Core Box Protection by MARTIN

"SAND ARRESTER TUBE"
Save cores and step up production. Guaranteed for 100,000 blows.

"HOLINER" BUSHINGS
Stop abrasion between blow plate and core box. Protect blow holes.

"PROTEXABOX PINS"
Cannot mar the box face because they will not loosen. Protective rubber tip guaranteed to stay on.

"PULLINSERT" BLOW BUTTONS
Positively stop sand blasting under blow holes. Available in nine popular sizes.

"STRIPINSERT"
Protects parting line—easily installed in old or new boxes. Cutters for groove available at moderate cost.

Rugged all-directional vibration that does not harm the faces of your sand hoppers or bins. Instantly self-starting, needs no lubrication or maintenance. Specify—the Peterson VIBROLATOR.

and NOW... **A NON-BINDING FLASK PIN**

No more production stoppages due to bending or binding of flask pins. No matter how much abuse these pins receive, they flex and absorb it without binding or breaking. They don't require excessive tolerances or skilled labor.

WRITE for descriptive literature or ask your distributor.

MARTIN ENGINEERING COMPANY
KEWANEE 3, ILLINOIS

safety program

continued from page 56

the place, the loud-speaker system, and occasionally an outside speaker. For instance, an expert on grinding wheels spoke following an accident in the grinding department; the highway safety director spoke at a meeting just before the vacation period; the Red Cross safety director demonstrated artificial-respiration methods at another meeting.

One department has a rule that if a man gets hurt he must be the leader at the next departmental safety meeting and discuss the accident. Workers report hazards and recommend accident-prevention measures. Prompt handling of such recommendations inspires workers to cooperate in the program.

This fine attitude of Stockham workers is a big factor in accident prevention and a valuable dividend in plant and community relations.

▶ *Safety contest shows gains in steel foundry practice*

Perfect safety records achieved by 15 foundries and noticeable gains in steel-foundry safety practice generally have been reported by the Safety Committee of the Steel Founders' Society of America. The announcement summarizes the results of the Society's 1952 safety contest, conducted through June, July, and August—months during which accident frequency rates tend to be high, according to the Committee's records. Rules of the American Standards Association were used to determine the ratings of individual foundries.

Of the 134 steel foundries participating on an industry-wide basis, 37 qualified for awards. Among these were 15 who won honor awards for accident-free operations during the three-month contest period. Closely trailing these were 22 others, which maintained near-perfect safety records with minimum lost-time accident ratings of 10.0 or less per 1,000,000 man-hours of exposure for the period. Among the top 15, six also won similar honor awards in 1951; of these, five maintained perfect safety records over the third consecutive contest period.

In a similar competition conducted throughout the steel castings industry in 1951, 10 foundries vied for top honors with perfect records, while 13 others earned lesser awards.

American Foundrymen's Society introduces

New Company Members

Aluminum Match Plate Corp., Buffalo, N. Y.—Charles E. Zimmerman, Pres. (Western New York Chapter).

Brighton-Dickinson Corp., Chicago, Ill.—Richard E. Marks, (Chicago Chapter).

Century Brass Works, Inc., Belleville, Ill.—Fred E. Lutz, Treas.-Gen. Mgr. (St. Louis Chapter).

City Pattern & Foundry Co., Inc. South Bend, Ind.—Leonard F. Tucker, Pres. (Michiana Chapter). Conversion from Personal

Grossman Co., South Amboy, N. J.—Franklin M. Grossman, Jr., Plant Mgr. (Metropolitan Chapter).

Michigan Wheel Co., Grand Rapids, Mich.—R. E. Cope (Western Michigan Chapter). Conversion from Personal

Wagner Electric Corp., St. Louis, Mo.—Harold S. Garrett, Asst. Dir. of Purchases (St. Louis Chapter) Conversion from Personal

Memphis Castings Works, Inc., Memphis, Tenn.—J. B. Stubblefield, Pres. (Non-Chapter).

Birmingham District Chapter

Merrill Alford, Gen. Plant Mgr., *Rudisill Foundry Co.*

Jack T. Kimbrough, Spec. Appr.—*Southern Wheel Div., American Brake Shoe Co.*

Moses A. Temerson, *Charles Temerson & Sons*

William M. Thomas, Plant Supt., *Rudisill Foundry Co.*

Gordon L. Turner, Dir. of Pers., *Rudisill Foundry Co.*

Canton District Chapter

Howard A. Mason, Jr., Special Engr., *American Steel Foundries*

L. L. Whitney, Asst. to Wks. Mgr., *American Steel Fdrs. (Alliance Works)*

Central Illinois Chapter

Carl Manz, Dist. Mgr., *Jacobsen & Daw, Inc.*

Central Indiana Chapter

Willard L. Bury, Engr., *National Malleable & Steel Castings Co.*

Henry Loviscek, Fmn., *National Malleable & Steel Castings Co.*

Mark M. Miller, Sales Mgr., *National Malleable & Steel Castings Co.*

Reginald E. Smith, Fdy. Engr., *National Malleable & Steel Castings Co.*

Central Michigan Chapter

C. N. Skidmore, Buyer, *Engineering Castings, Inc.*

Merrill E. Starr, Sales Engr., *Macklin Co.*

Kenneth H. Priestly, Chairman, Saginaw Valley Chapter—which has shown steady membership gain during last three months.

Central Ohio Chapter

Robert Harruff, Service Engr., *The Ohio Steel Foundry Co.*

John McCaughey, Molding Supv., *The Ohio Steel Foundry Co.*

J. R. McConnell, *The Globe Steel Abrasive Co.*

H. C. Ripper, *The Globe Steel Abrasive Co.*

Joseph Smedley, Fdy. Supv., *The Ohio Steel Foundry Co.*

Ralph Wagner, Process Insp. Supv., *The Ohio Steel Foundry Co.*

Robert Washam, Serv. Engr., Eastern Clay Products, *Int'l. Minerals & Chem. Corp.*

Russell Wildoner, Molding Supv., *The Ohio Steel Foundry Co.*

Robert C. Williams, Rsch. Engr., *Battelle Memorial Institute*

Chicago Chapter

John W. Cotey, Engr., *Continental Foundry & Machine Co.*

Cleo N. Diehl, Sales, *Continental Foundry & Machine Co.*

Karl A. Lang, Mgr., Melting Div., *Lindberg Engineering Corp.*

Richard E. Marks, *Brighton-Dickinson Corp.*

Joseph B. Nalls, Chief Engr., Hull Fabricating Div., *Continental Fdy. & Mach. Co.*

H. B. Puff, Sls. Engr., *Durez Plastics & Chemicals, Inc.*

Cincinnati Chapter

George Boden, Fdy. Fmn., *Star Foundry*

Daniel J. O'Donnell, Sales, Semet-Solvay Div., *Allied Chem. & Dye Corp.*

Richard J. Westendorf, Vice-Pres. & Gen. Mgr., *Dayton Casting Co.*

Corn Belt Chapter

Milton L. Galinsky, Plant Mgr., *Sioux City Foundry & Boiler Co.*

Frank B. Oswald, Patternmaker, *Dempster Mill Mfg. Co.*

Gerhard A. Schulz, Patternmaker, *Dempster Mill Mfg. Co.*

Detroit Chapter

Edward C. Bayer, Met. Engr., *Holcroft & Co.*

Lawrence F. Harding, Sales Engr., C. O. *Bartlett & Snow Co.*

Norman K. Kann, Treas. & Gen. Mgr., *Clayton-Sherman Abrasives Co.*

Paul Labens, Fmn., (Plant-Jobbing Foundry) *Ford Motor Co.*

William G. Westergan, Tech. Repr., *Bakelite Co., Div. of Union Carbide & Carbon Corp.*

Richard O. Williams, Met., *Ford Motor Co.*

John Yosin, Development & Rsch., *(Dodge Main Fdy.) Chrysler Corp.*

F. C. Young, Mgr., *Quality Control Laboratory, Ford Motor Co.*

Eastern Canada Chapter

John Antonescue, Chemist, *Dominion Engineering Works, Ltd.*

Maurice Bibeau, Appr., *Dominion Engineering Works*

Alex Bonnell, Fmn., Foundry Div., *Canadian Car & Foundry Co., Ltd.*

Robert James Clayton, Appr., *Dominion Engineering Co.*

William Doucette, Supv., *Canadian Car & Foundry Co., Ltd.*

Charles E. Gouin, Met. Engr., *Joliette Steel Div., Dominion Brake Shoe Co.*

Emil B. Koller, Appr., *Dominion Engineering Co.*

Richard Lake, Fmn., *Canadian Car & Foundry Co., Ltd.*

P. E. Lefebvre, Prop., *Fonderie Rigaud*

Ralph Ley, Appr., *Dominion Engineering Works*

A. W. Mackenzie, *Dominion Brass & Aluminum Foundry, Ltd.*

David C. Sunnucks, Asst. to Tech. Dir., *Aluminum Co. of Canada, Ltd.*

Harry Walford, Moulder, Foundry Div., *Canadian Car & Foundry Co., Ltd.*

Metropolitan Chapter

Herbert P. Bersey, *Sales Mgr., Such Clay Co.*

George W. Burger, *The Beneflux Corp.*

Emil J. Camilleri, Supv., *World Brass Foundry*

George C. Fehrenback, Metal Controlman, *American Light Alloys, Inc.*

John Miksis, Sales Engr., *Master Pneumatic Tool Co., Inc.*

Franklin M. Grossman, Jr., Plant Mgr., *Grossman Co.*

William Schwartz, Fdy. Fmn., *Burndy Engineering Co., Inc.*

Joseph J. Shiel, Jr., Fdy. Supt., *Arwood Precision Casting Corp.*

Alex D. Tobia, Asst. Fdy. Mgr., *American Light Alloys, Inc.*

Michiana Chapter

Robert G. Hintz, Time Study Supv., *Oliver Corp.*

William B. Myers, Fmn., Pattern Shop, *Oliver Corp.*

Vernon J. Slack, Training Dir., *Oliver Corp.-Plant #1*

Mokan Chapter

Earl W. McFarland, Pattern Shop Fmn., *Locomotive Finished Material Co.*

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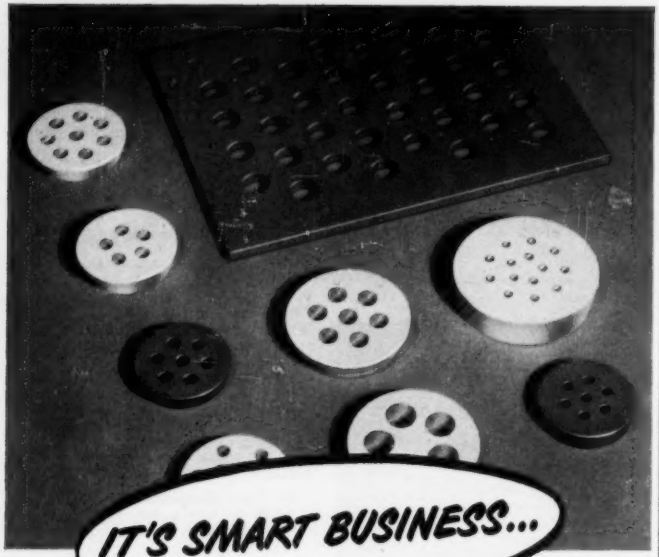

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TO USE

ALSiMAG® Ceramic STRAINER CORES

- Strong, will not break in handling
- Non-spalling
- Easy and fast to handle
- Not affected by moisture
- Flat and uniform
- Completely free of gas
- Resist heat shock
- No erosion at normal pouring temperatures
- Do not contaminate scrap

Maybe you think you are making your own sand-oil strainer cores cheaper than you can buy AlSiMag Ceramic Strainer Cores — BUT CAN YOU?

By the time you figure costs of sand, binder, oil, LABOR in mixing and core rooms, core oven costs and OVERHEAD you may find that *AlSiMag Cores are actually lower in cost.*

Most "Home Made" cores have comparatively little strength. They have to be handled slowly and with care. Even then a lot of them are wasted because they break. Holes may not be accurate or the core may break down in pouring. Then you've got nothing to show for all your trouble and expense.

AlSiMag cores are tough and fast to handle. They are flat, accurate and uniform. They are completely free of gas. They resist heat shock. They do the job, give you cleaner, smoother castings and LESS REJECTS.

SEE FOR YOURSELF—ask for free samples of sizes in stock; test them under the toughest conditions in your foundry. You'll see that AlSiMag Ceramic Strainer Cores pay for themselves many times over.

OUR NEW MODERN PLANT AND HIGH SPEED PRODUCTION FACILITIES PERMIT NEW LOWER PRICES AND DELIVERY IN ANY QUANTITY.

AMERICAN LAVA CORPORATION

CHATTANOOGA 5, TENNESSEE

51ST YEAR OF CERAMIC LEADERSHIP

A. F. S. introduces

continued from page 105

Northeastern Ohio Chapter

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Thomas L. Chase, Met. Engr., *Western Automatic Machine Screw Co.*
John A. Cleary, Prod. Mgr., *Sand Products Corp.*
Jack W. Dunbar, Quality Control, *National Malleable & Steel Castings Co.*
Barney V. Gailawiez, *Lake City Malleable Co.*
Charles G. Jancura, Met., *Aluminum Co. of America*
George Magargee, Gen. Insp. Fmn., *National Malleable & Steel Castings Co.*
William A. Morgan, Traffic Mgr., *The Smith Facing & Supply Co.*
Charles W. Taylor, Fdy. Supv., *National Malleable & Steel Castings Co.*
Don H. Taylor, Foundry Trainee, *Cleveland Fdy., Ford Motor Co.*
Erwin J. Gamber, Met., *Aluminum Co. of America*

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Edward W. Stephens, Secy.-Treas., *American Brass & Iron Foundry*

Ontario Chapter

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George H. Bell, Asst. Supt., *Standard Sanitary & Dominion Radiator, Ltd.*
Phillip Bratkin, Fdy. Fmn., *Standard Sanitary & Dominion Radiator, Ltd.*
A. W. M. Brymer, Sales Engr., *Federated Metals Canada, Ltd.*
Orrin Carson, Professor, *Queens University*
Peter Eaboni, Core Rm. Fmn., *Standard Sanitary & Dominion Radiator, Ltd.*
Lorne W. Frame, Editor, *"Canadian Metals" Westman Publications, Ltd.*
James W. Fry, Plant Engr., *Standard Sanitary & Dominion Radiator, Ltd.*
Victor R. Fulthorpe, Tech. Repr., *Foundry Services (Canada) Ltd.*
Axel Lindros, Fmn. Patternmaker, *Standard Sanitary & Dominion Radiator, Ltd.*
Norman R. McCaffrey, Jr., Fmn., *International Harvester Co., Ltd.*
Edwin Moyer, Fmn. Hartley Fdy. Div., *London Concrete Machinery Co., Ltd.*
John A. Murray, Salesman, *Federated Metals Canada, Ltd.*
M. W. Nichol, Supv. Fdy., *Wm. Kennedy & Sons*
Frederick H. Palmer, Fmn.-Foundry, *Neptune Meters, Ltd.*
Robert W. Patch, Salesman, *Federated Metals Canada, Ltd.*
Wilfred G. Radke, Chief Clerk, *Standard Sanitary & Dominion Radiator, Ltd.*
Wesley Radke, Fdy. Supt., *Standard Sanitary & Dominion Radiator, Ltd.*
David Rose, Sand Tester, *Standard Sanitary & Dominion Radiator, Ltd.*
Stuart Stuart, Fdy. Fmn., *Yale & Towne Mfg. Co.*
Harry Turner, Fdy. Fmn., *Standard Sanitary & Dominion Radiator, Ltd.*
Russell Wood, Works Mgr., *Yale & Towne Mfg. Co.*
John W. Wotherspoon, Secy. Treas., *J. A. Wotherspoon & Son, Ltd.*

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Robert A. Boynton, Core Room Fmn., *J. I. Case Co.*
Chester R. Dominacki, Fmn., *Riverside Foundry*
David E. Gilchrist, Mech. Engr., *Deere & Co.*
Lyman J. Hansen, Jr. Mech. Engr., *John Deere Waterloo Tractor Works*
Melvin L. Ingram, Fmn., *John Deere Spreader Works*
Duane John Micklewright, Molding Fmn., *J. I. Case Co.*
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Saginaw Valley Chapter

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Louis M. French, Fmn., Central Fdy. Div., *Saginaw Malleable Iron Plant, GMC*
Arthur Koch, Fmn., Central Fdy. Div., *Saginaw Malleable Iron Plant, GMC*
Joseph C. Kremer, Supt. of New Pdt. Dvlpt., Central Fdy. Div., *Saginaw Malleable Iron Plant, GMC*
George Meyers, Supt. Core Rm., Central Fdy. Div., *Saginaw Mall. Iron Plant, GMC*
Arvin D. Neuwirth, Supv., Central Fdy. Div., *Saginaw Malleable Iron Plant, GMC*
Robert L. Page, Supt. Core Rm., Central Fdy. Div., *Saginaw Malleable Iron Plant, GMC*
William J. Phelan, Safety Dir., Central Fdy. Div., *Saginaw Malleable Iron Plant, GMC*
Bruce D. Smith, Fmn., Central Fdy. Div., *Saginaw Malleable Iron Plant, GMC*
Robert Swoverland, Supv., Central Fdy. Div., *Saginaw Malleable Iron Plant, GMC*

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Jack W. Porte, Branch Sls. Mgr., *Monsanto Chemical Co.*
Charles Wasem, Secy. & Fdy. Supt., *Century Brass Works, Inc.*

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Charles A. Thompson, Chemist, *Herco Foundry*

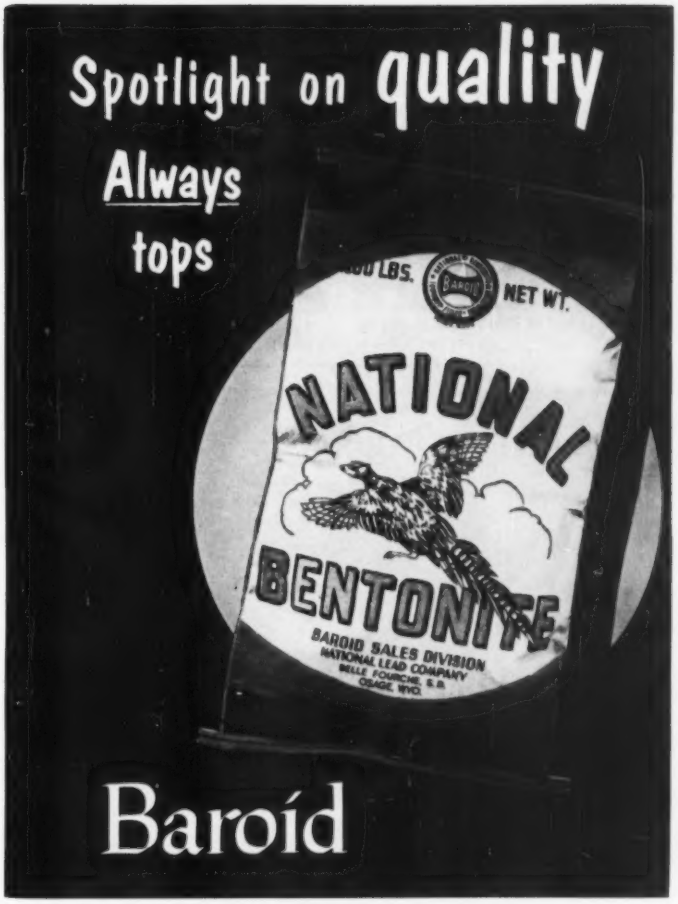
Tennessee Chapter

Richard A. Baker, Asst. Fmn., *U. S. Pipe & Foundry Co.*
Bert Davis, Asst. Works Mgr., *Corley Mfg. Co.*
Houston Gunn, *Crane Co.*

Texas Chapter

George E. Bush, Field Engr., *Cleco Div. of Reed Roller Bit Co.*
Archie William Cotie, Student, *University of Houston*
Ernest E. Graham, Owner, *E. E. Graham & Co.*
Roy E. Hopkins, Master Mech., *East Texas Steel Casting Co., Inc.*
Fred Mosley, Pres., *Mosley Machinery Co., Inc.*
Erven Olson, Pattn. Shop Fmn., *Oil City Iron Works*
Leon Shaw, Supt., *Shaw Foundry*
J. M. Webb, Owner, *Webb Pattern Works*

continued on page 111



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foundrymen

continued from page 30

as educational circles, was *"Are Technical Graduates Getting Adequate Training in College?"* It appeared in the September issue. He has long been active in A.F.S. and is chairman of the Light Metals Division.

Among the extra-curricular activities of foundrymen is that of superintendent of cemeteries. **E. W. Horlebein,** president, Gibson & Kirk Co., Baltimore, Md., a long-time foundryman, and past-president of A.F.S., is reported recovering his former shovel techniques since he has been elected superintendent of maintenance for St. Paul's Lutheran Cemetery, Baltimore.

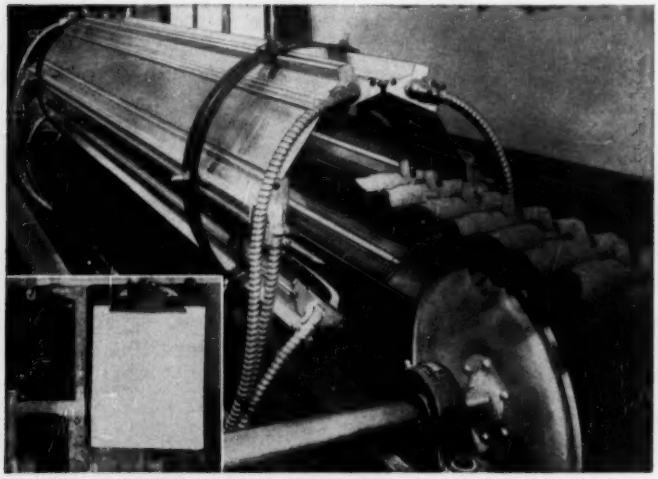
J. P. McClendon describes on page 56 his company's safety practices which, in addition to other records, have led to 17½ years in the pattern shop without a lost-time accident. Pat is superintendent of services for Stockham Valves & Fittings, Inc., Birmingham, Ala. When he's not otherwise occupied he's covering Birmingham District Chapter activities for AMERICAN FOUNDRYMAN or arranging for news story or photo of a foundry personality to appear in a Birmingham newspaper.

Ervin B. Owens has been appointed personnel director and **Ralph Babusci** purchasing agent of supplies for Ajax Metal Div. of H. Kramer & Co., Philadelphia, Pa. Mr. Owens, will also act as administrative assistant to **T. A. Landis,** plant superintendent.

R. I. Taylor tells how to control cupolas with thermocouples protruding through the lining a few feet below the charging door in his paper starting on page 46. Using the arrangement he describes, he reports it is possible to run the cupola entirely by instrument and to correct deviations in operation before the metal is affected. Mr. Taylor is chief metallurgist at Suffolk Iron Foundry (1920) Ltd., Suffolk, England. His paper originally appeared in *Foundry Trade Journal.*

Robert D. Dodge has returned to his post as sales representative for the foundry products division of Archer-Daniels-Midland Co., Cleveland, after two years' service with the Army.

Robert D. Dodge . . . returns to sales post



Six Chromalox 3 kw. all-metal Electric Radiant Heaters making up this 6 ft. aluminum tunnel oven, provide wide-band infrared heat for uniform drying of sand cores used in manufacture of plumbing fixtures. Oven has quick warm-up, closely controlled, easily duplicated heat for any core size. Inset shown is input controller and production chart for recording time and temperature.

Electric Sand Core Oven Triples Drying Capacity

Milwaukee, Wisconsin—A unique, all metal infrared tunnel oven has tripled capacity for drying wash-dipped sand cores of a local manufacturer of brass plumbing fixtures. It also takes less floor space than the fuel-fired oven it replaced; has reduced handling, minimized breakage, and lowered operating costs.

The oven consists of a 6 ft. aluminum tunnel, 11" in diameter, with six Chromalox 3 kw., rod-type electric radiant heaters clamped to circular shaped angle iron. Heaters radiate long wave length, unfiltered infrared heat that is absorbed with almost equal speed by all colors and surfaces; have 30-second percentage timers to closely control temperature and on-off heat cycles, and prevent burned or damp cores; provide oven temperatures up to 450°. Tunnel dries wash in two minutes; old oven required 10 to 15 minutes drying time. New oven can be turned off when not in use and brought up to temperature again in two minutes. Old oven required an hour warm-up. This latter difference alone reduced operating costs by $1.25 a day.

Cores are set on conveyor as dipped, carried through tunnel at 6 fpm, and conveyed 11' beyond tunnel exit, where they are cool enough to handle. They were racked after dipping under old system, and dried in batches: by time rack was filled, wash had soaked into some of cores, and crumbing occurred.

The new setup occupies only 45 square feet at end of room. Old oven required 100 square feet in room center.

MORE INFORMATION

Further data on this and other efficient applications of Chromalox Electric Radiant Heaters is available without obligation by writing: EDWIN L. WIEGAND COMPANY, 7609 Thomas Blvd., Pittsburgh 8, Pa.

88-34

CHROMALOX

Electric heat for modern industry

obituaries

William Hoernke, 75, former plant superintendent Wisconsin Appleton Co., Milwaukee, died September 19. He had served in successive positions with Appleton and the Stowell companies for 48 years, and had been a foundry worker for 57 years. In 1943 he received the "Old Timer's Plaque" for 50 years' continuous service. He was a member of A.F.S. and the Milwaukee Malleable Club.

Irwin E. Sanger, assistant treasurer and purchasing agent of Strong Steel Foundry Co., Buffalo, N. Y., died October 18.

Frederic S. Ferguson, 79, founder and president of Standard Foundry & Supply Co., Ltd., died October 24 following a lengthy illness. He had been a leading Windsor (Ont.) civic figure for over 35 years and played an important role in the industrial development of that city.

Under his guidance the company he headed became one of the largest in its district. He was also well known in Detroit business and industrial circles, having operated the Apex Foundry there for some time.

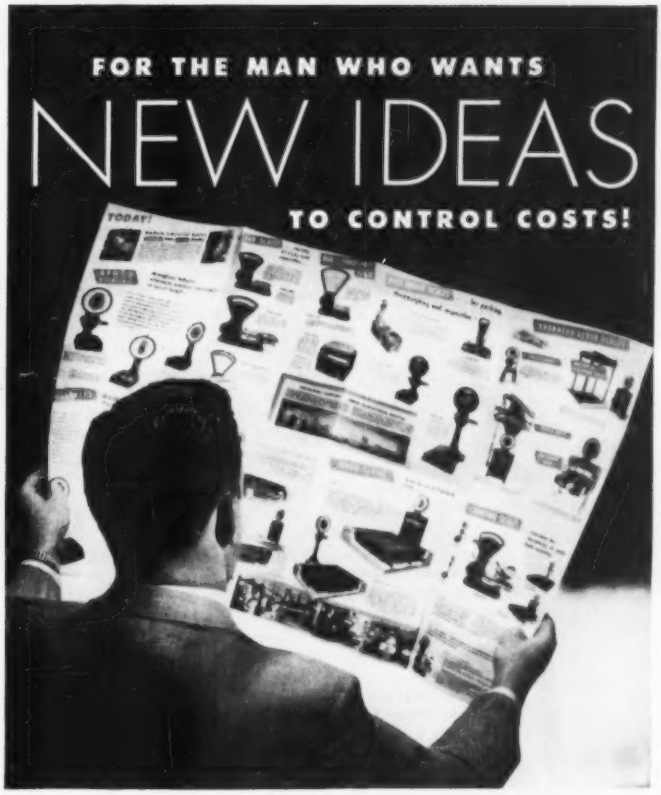
Arthur K. Higgins, 44, assistant research director of Allis-Chalmers Manufacturing Co., Milwaukee, died November 6. He came to Allis-Chalmers in 1937 after four years with Globe-Union, Inc., Mil-

Arthur K. Higgins . . .

waukee. Previously he had been associated with American Smelting & Refining Co. as chemist. At the time of his death, he was in charge of the metallurgical, chemical, melting, and physics laboratories of A-C's research division. Mr. Higgins was active in affairs of A.F.S. as chairman of its Brass and Bronze Division.

George Magee Enos, 56, professor of physical metallurgy, Purdue University, was stricken with a cerebral hemorrhage October 27 and died shortly afterward. Dr. Enos had been on the Purdue staff since 1946. A native of Dubuque, Iowa, he was awarded his bachelor's degree from the University of South Dakota and his master's from Massachusetts Institute of Technology, and his PhD from the University of Cincinnati. He saw service in both World Wars and came to Purdue after leaving the army the second time. Previously he had taught at the University of Cincinnati. He wrote numerous textbooks and scientific treatises.

Claude Clifford Sohl, manager of the Casualty Safety & Group Insurance Dept., American Steel Foundries, Chicago, died suddenly November 10 of a heart condition. He was 60 years old. Before joining American Steel Foundries he had been associated in a supervisory capacity with Standard Car Manufacturing Co., Hammond, Ind. (now Pullman Standard Car Manufacturing Co.) for more than 19 years. Mr. Sohl was a member of A.F.S. Safety & Hygiene and Air Pollution Steering Committee. He was a member of the Hammond, Ind. school board and active in civic affairs of that city.



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Whatever your problems in scales for receiving, charging, counting, or other foundry weighing operations . . . there's a modern Toledo to do the job with high *accuracy, speed* and *dependability.* Have you checked your scale needs? Get latest information in this widely used reference on Toledos that help you guard costs . . . speed production. Look into the advantages of Printweigh in stopping losses that originate through human errors. Send coupon for new edition—"Toledo, Headquarters for Scales."

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To accurately measure temperature of molten, nonferrous metals, readings should be made *below* the surface.

Portable, handy to use, the Alnor Pyro Lance has a protected thermocouple mounted in the lance tip—it takes temperatures below the surface, where accuracy is unaffected by dross and other surface conditions. Enclosed couple is protected against flame, fumes, and corrosion, assuring long, accurate service under severe conditions.

Pyro Lance models are available for a wide variety of metals and foundry operations. Write today for Bulletin 1724-D and see how you can have low-cost quality control in your foundry. Illinois Testing Laboratories, Inc., Room 557, 420 North LaSalle St., Chicago 10, Illinois.

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

bell castings

continued from page 50

up. Ovening removes the wax leaving its negative impressions in the cope half of the mold. However a recent and more efficient method of producing such decorations is by impression. In this method, the cope is built up in successive layers, each being dried before the next is applied. In the final stage, a coating of graphite is applied to give a refractory surface. This surface is then dampened sufficiently to take reverse-letter or decorative stamps.

When the cope is inverted over the core, a top mold—either canon (a crown of loops) or flat—is added with a pouring head which has a vent for escaping air.

Bell metal hasn't changed much through the centuries either, Dr. Howard asserts. It still is approximately 13 parts copper to 4 of tin. This mixture produces a hard, very durable metal subject only to initial surface corrosion which then forms a protective coating. Addition of more tin or soft metal, strangely enough increases hardness and improves musical quality of the metal, while at the same time making it more brittle—providing an area for calculated risk in which an English foundry produced our over-brittle Liberty Bell.

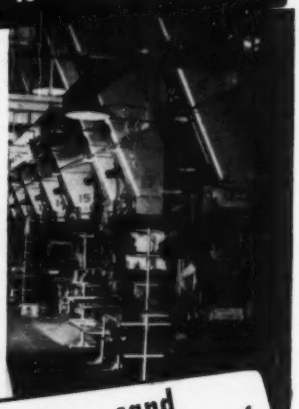
Metal for the larger modern bells is generally melted in coal- or oil-fired reverbatory furnaces and tapped out into a ladle for pouring. Smaller pours are melted in the crucible of a tilter furnace "jacketed" by coke or oil fire. Heats are tapped at about 1100 C.

Final step is tuning. Perfect tone at first testing was the goal of early founders. Actually achieving a close proximity to the correct pitch is a remarkable achievement of engineered casting. Today, when precise harmony is required for chimes, carillons and the like, bell castings are engineered for a tone a bit sharp of its final pitch—by use of an excess of metal.

In tuning the bell is inverted on a revolving base plate and its inside surface is machined off until the precise harmonic series desired is produced.

Tuned bells are generally minor in key. Maybe that's why melodies that are minor in key—like "God rest you, merry gentlemen"—sound so fine about this time of the year.

Is it worth $52.05



to keep sand *Moving Through* your hoppers?

That's all it costs for an average foundry installation of a Cleveland Air Vibrator on a standard steel hopper of 3000# capacity!

Not much money, is it, to *guarantee* even, continuous flow of sand into, through and out of your hoppers?

There's a type Cleveland Air Vibrator for all your foundry requirements.

Arching, sticking and bridging can be eliminated temporarily with a hammer, but that's doing it the hard, expensive way.

A Cleveland Air Vibrator can be easily installed and set to operate either continuously, or on an intermittent basis. Won't ruin your bins.

The Type F, illustrated, is widely used in foundries across the country and in Canada and is made in 6 sizes.

Standard metallic impact and quiet types available.

***BIN** STUCK LATELY?*

Write for Folder No. F-351 for further details

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A.F.S. introduces

continued from page 107

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John F. Erler, Owner, *Acme Pattern & Engineering Works*
H. B. Rosenblatt, Owner, *Ohio Iron & Metals Co.*

Tri-State Chapter

Ralph D. Zangrilli, Pres., *Standard Electric Castings Co.*

Western Michigan Chapter

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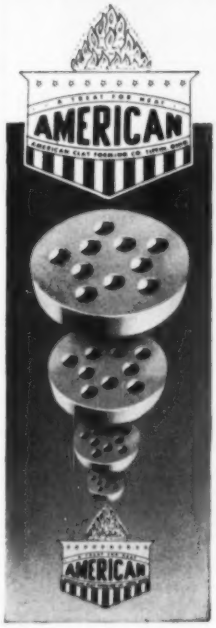

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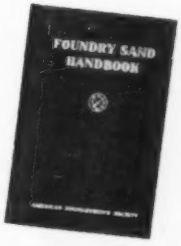

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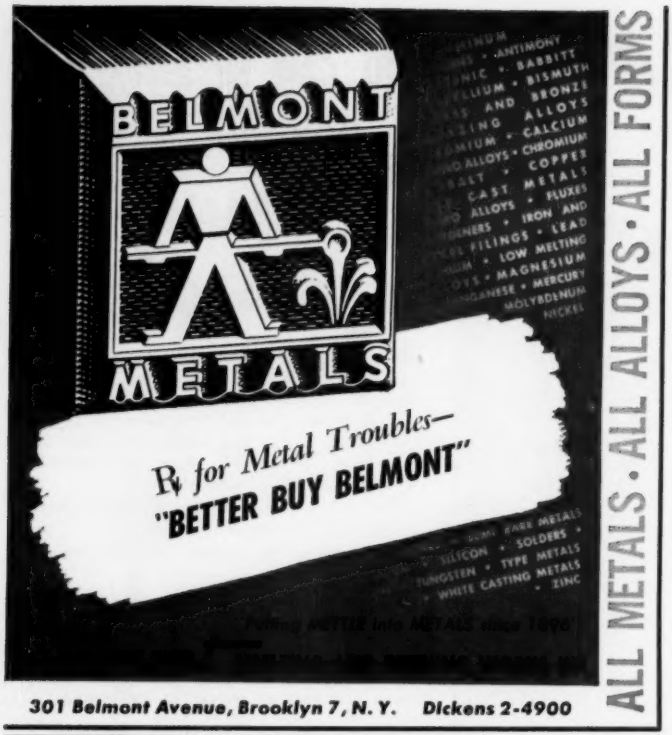

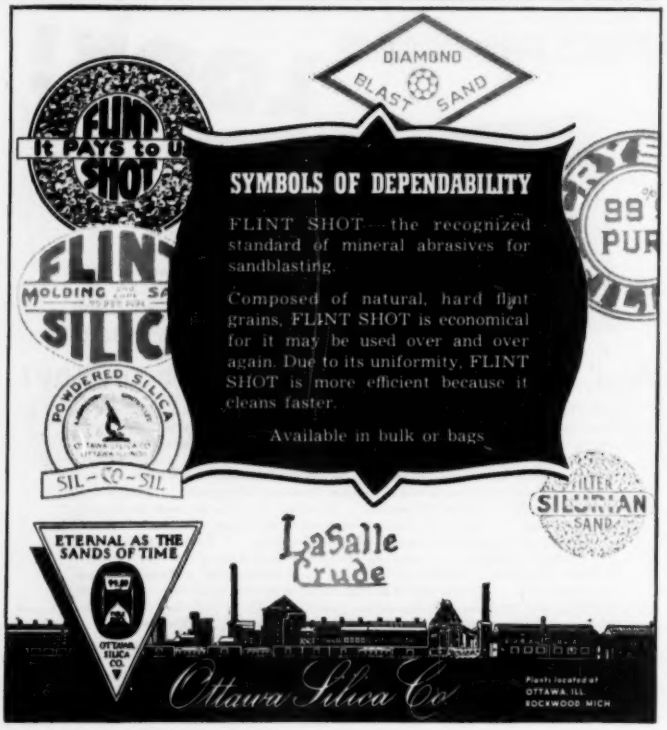
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Engineers Club, Baltimore. R. E. Morey, Naval Research Laboratory, Washington, D. C. "*The Effect of Binders in the Development of Sand Strength.*"

19. . Metropolitan
Essex House, Newark, N. J. Christmas party.

1953

January

5. . Central Indiana
Athenaeum Bldg., Indianapolis. G. Vennerhold, Ford Motor Co., Dearborn, Mich.

5. . Metropolitan
Essex House, Newark, N. J. S. C. Massari, A.F.S. Technical Director. "*Effect of Gating Design on Casting Quality.*"

5. . Chicago
Chicago Bar Association. Round Table Meetings. Gray Iron: "*Gating and Risering,*" Malleable: "*Cores,*" Non-Ferrous: "*Sand,*" and Steel and Pattern: Joint Meeting.

5. . Central Illinois
American Legion Hall, Peoria, Ill. J. S. Schumacher, Hill & Griffith Co., Cincinnati. "*Foolproof Sand.*"

6. . Rochester
Seneca Hotel, Rochester, N. Y. Geo. P. Halliwell, H. Kramer & Co., Chicago. "*Non-Ferrous Foundry Practice.*"

8. . Northeastern Ohio
Tudor Arms Hotel, Cleveland. Howard F. Taylor, Massachusetts Institute of Technology. "*The Feeding of Castings.*"

8. . Canton District
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8. . St. Louis District
Hotel York, St. Louis. Howard V. McClelland, Eaton Manufacturing Co., Vassar, Mich. "*Permanent Molds.*"

8. . Saginaw Valley
Fischer's Hotel, Frankenmuth, Mich. H. Bringhurst, Semet Solvay Div., Allied Chemical & Dye Corp., Detroit. "*Cupola Fuels.*"

9. . Eastern Canada
Mount Royal Hotel, Montreal, Que. L. A. Kleber, General Steel Castings Corp., Granite City, Ill.

9. . Central New York
Onondaga Hotel, Syracuse, N. Y. Round Table Meetings. Malleable Iron, Non-Ferrous, Gray Iron and Patternmaking.

9. . Corn Belt
Rome Hotel, Omaha. W. B. George, R. Lavin & Sons, Inc., Chicago. "*Metallurgy in the Brass Foundry.*"

9. . Philadelphia
Engineers' Club, Philadelphia. Panel Discussion: "*Some Causes of Defects in Non-Ferrous Castings.*" W. Donald Bryden, Philadelphia Brass & Bronze Corp. Film: "*Core Making.*"

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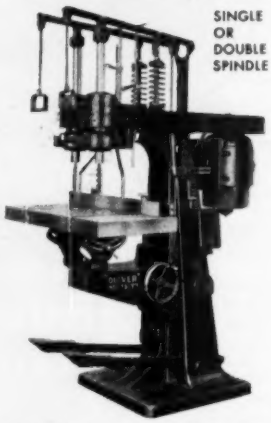

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Inspecting precision transmission housing for a U. S. Army Ordnance vehicle. 37 cores are used to produce this "Quality" giant which is cast in a dry sand mold.

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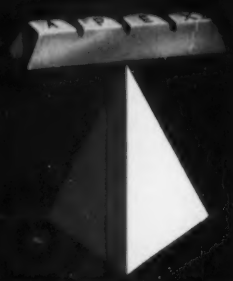

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